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With the Authors respects

FURTHER OBSERVATIONS

ON THE

VARIOLÆ VACCINÆ,

ILLUSTRATED WITH COLOURED ENGRAVINGS FROM ORIGINAL DRAWINGS.

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OBSERVATIONS.

The imperfect knowledge which we at present possess on many points connected with the natural history of the *variolæ vaccinæ,* and the numerous and formidable impediments to the improvement and extension of that knowledge, demand the continuance of vigilant, patient, and diligent inquiry. The inherent and contingent difficulties which attend many of our investigations into the remote, predisposing, and exciting causes of this interesting disease, though in many respects not under control, in some measure admit of very material mitigation. The infrequency of the disease must always prove one of the greatest obstacles to the rapid accumulation of facts of a really valuable character; but there is good reason to believe that an increase of the number of competent observers will abate much of this difficulty, by leading to more frequent detection. An increase of the number of competent observers however, without the diffusion of a greater amount of discriminating knowledge among the proprietors and attendants of the subjects of the disease, will be but an imperfect approximation to the amount of means indispensable to the success of our inquiries. The careful record of every fact bearing immediately or remotely on the points above mentioned, irrespective of any theory—the improvement and perfection of the means of diagnosis, by the study of the exanthemata of the lower animals, particularly those of the cow—and the diffusion of such knowledge, in the proper quarters, by those whose time, situation, and circumstances, will admit, seem to me to be essential to the successful promotion of our object.

With a conviction of the value of these investigations to medical science—not I trust overrated, and under the influence of the encouragement offered by this Association, manifested by the distinguished, but I fear unmerited, reception which it has given to my former observations, I am induced to offer a few additional facts which I have lately had occasion to witness, and which, from their importance, have been investigated with all the care and impartiality of which I am capable. I am desirous also of adding some additional observations, illustrative of some particulars contained in my former communication, which required time to furnish.

For the opportunity of making the following observations, and investigating and recording the facts, I am indebted to the very great kindness and intelligence of my friend, Mr. Thomas Knight, surgeon, of Brill, who has on former occasions rendered me invaluable assistance in the prosecution of similar inquiries.

Cases of variolæ vaccinæ occurring in cows and milkers.—On Friday, the 22nd of October, 1840, my friend Mr. Knight informed me, by letter, that he had on that day seen on the hand of a patient (Mr. Pollard), aged 56, who had never had small-pox or vaccine, two broken vaccine vesicles, which the patient stated he had caught while milking his own cows, some of which he knew were affected by the same disease, and were then very difficult to milk. Mr. Pollard at the same time expressed his conviction "*that his cows had been infected from human small-pox effluvia,* to which he considered they had been exposed."

On the following day I proceeded, in company with Mr. Knight, to the farm of Mr. Pollard, in the village of Oakley, about two miles from Brill, at the extreme and north-west end of the Vale of Aylesbury, and about sixteen miles from the town of Aylesbury. We saw the ruptured vaccine vesicles, with their central sloughs, on the hand and fingers, which were apparently between the second and third week of the disease, and carefully examined the cows. The cows were ten in number: eight milch cows and two sturks. On two of the milch cows there were the vestiges, on each, of not fewer than twenty-five to thirty vaccine vesicles on the teats, and the remains of one vesicle on each udder. On two others we noticed the remains of not more than half that number of vesicles on each; and on the fifth milch cow there was evidence of only one vesicle on the hinder part of the teat, which, being out of the way of the milker, was completely desiccated and entire, forming a characteristic blackish-brown oval crust. This crust on the teat, and two crusts on the udders of the other cows just mentioned, were the only perfect crusts observed. On the teats all the imperfect crusts had been casually and prematurely removed by the manipulations of the milkers, and, hence, were visible florid ulcerations, many of which were manifestly depressed in the centre, and *all* surrounded with the more or less circumscribed, indurated and elevated integumental boundary which marks the vaccine disease. Upon the udder of one of the affected milch cows was observed an abundance of the sub-epidemic vesicles or bullæ, which not unfrequently arise during the acme and after the decline of the vaccine disease. Three of the milch cows, although carefully and repeatedly inspected at that time and at subsequent periods, indicated no external trace of the disease. One of the sturks, not then supposed to be in calf, (but subsequently proved to have been so two months,) appeared to have several dark brown partially adherent crusts on the teats; but was very wild and intractable, and could not be caught and carefully inspected at the time. The other sturk appeared, like the three milch cows just mentioned, to have entirely escaped the disease.

After the inspection of the cows we were fortunate enough to find another milker, Joseph Brooks, aged 17, (who had had neither small-pox nor the vaccine,) with a very fine vaccine vesicle on the right temporo-frontal region, another over the last articulation of the thumb, and a third on the radial aspect of the ring finger, all just past their acme, as the diffused areolæ had evidently disappeared. From the first vesicle we obtained lymph, and immediately used it.

In reference to the presumed origin of the disease on the cows, from small-pox effluvia, as intimated by the proprietor, we obtained some remarkable facts; but previously to detailing the particulars of his statement, and that of the milkers, it is necessary to remark that both Mr. Knight and I were aware that the small-pox had been casually introduced into the village in which this farm was situated, about the commencement of the preceding June; but this being met, on the part of Mr. Knight, by prompt vaccination, only twelve cases of small-pox had occurred up to the time when the above cows exhibited their disease. Of this number of small-pox cases the last three were, a woman, aged 40, who had been satisfactorily *inoculated* in infancy by the celebrated *Sutton,* a young child, and a woman rather beyond the middle period of life. The two cottages in which these three patients resided during their illness were situated on each side of, and closely connected with, a long narrow meadow or close, comprising scarcely two acres. The first-named patient, though thickly covered with pustules, was not confined to her bed after the full development of the eruption; but frequently crossed the meadow to visit the other patients—the woman and child, the former being in great danger with the confluent and malignant form of the disease. She died on Monday, the 7th of September, and, according to custom, was buried the same evening. The intercourse between the cottages, across the close, was of course continued after this event. On the following day the wearing apparel of the deceased, bed-clothes, bedding, &c., of both patients, were exposed for purification on the hedges bounding the close; the chaff of the child's bed was thrown into the ditch; and the flock of the deceased woman's bed was strewed about on the grass within the close, where it was exposed and turned every night, and for several hours during the day, till the 13th of September—eleven days. On that day the above-mentioned eight milch cows and two sturks were turned into this meadow to graze. They entered it every morning for this purpose, and were driven from it every afternoon to be transferred to a distant meadow to be watered and milked, where they remained through the night. Whenever the cows quitted the meadow in question, in the afternoon, the infected articles above-mentioned were again exposed on the hedges, and the flock of the bed spread out on the grass and repeatedly turned, where it remained till the morning, when the cows were readmitted. It appears however that the removal of the infected articles was not always accomplished so punctually as had been enjoined; for both the proprietor and the milkers affirm that on one occasion, at least, they observed the bed flock on the grass, and the cows amidst it, and licking it up. The proprietor positively declares, and the milkers corroborate his statement, "that the animals were in perfect health on their first entering this close; but within twelve or fourteen days of that event five of the milch cows appeared to have heat and tenderness of the teats, upon which, embedded in the skin, were distinctly felt small hard pimples, which daily increased in magnitude and tenderness, and in a week or ten days rose into *blisters*, and quickly ran into brown and blackish scabs. At this period, when the teats were thus *blistered* and swollen and very tender, the constitutional symptoms were first observed, viz., sudden 'sinking,' or loss of milk, drivelling of saliva from the mouth, and frequent inflation and retraction of the cheeks, staring of the coat, 'tucking up of the limbs,' and 'sticking up' of the back, and rapid loss of flesh. The process of milking was now very difficult, disagreeable, and even dangerous; and on the 14th of October, the middle of the third week, the detachment of the crusts and loose cuticle, and the abundant discharge of pus on attempting to milk, compelled the milkers to desist for the purpose of washing their hands. Soon after this period the cows became by degrees more and more tranquil as the tenderness and tumefaction of the teats subsided, and, finally, milking was performed with comparative facility;" and at the period of our visit scarcely any trouble arose in the performance of the operation, though here and there a teat seemed still tender.

Cases of casual vaccine in the milkers.—CASE 1.—Mr. Pollard, æt. 56, had never had vaccine. He had been, some years previously, exposed to small-pox infection with impunity; while his companion, a young man, took the disease and died. Mr. Pollard had since that held himself exempt from risk of small-pox.

The vaccine vesicles, when first seen by Mr. Knight, on the hand and finger, had burst, the secondary constitutional symptoms were declining, and the centres of the vesicles, as usual, were in a sloughing state. The patient says, that about ten days after the discovery of the disease on the cows, he observed two itching small pimples on the site of the present ulcers, which, according to his account, ran the normal course of the vaccine vesicle; that as soon as the areolæ commenced, having felt scarcely any indisposition before, pain and tenderness of the axillary glands, with the usual constitutional symptoms, arose, and gradually increased for four or five days, but were never severe enough to confine him to the house. They had entirely ceased on the day Mr. Knight and I saw him, and the topical inflammation was rapidly departing; the vesicles were quite broken up, and a blackish brown slough adhered to their centres, their base being surrounded with an elevated induration of a livid red colour.

CASE 2.—Joseph Brooks, æt. 17, a fine, healthy, intelligent young man. Had not been the subject previously of variola or the vaccine Stated that he commenced milking on Friday, the 9th of October, and that his milking was confined to four cows, only *one* of which had the disease—from four to six vesicles on each teat. He milked those four cows occasionally, and continued to do so till the 18th of the same month—ten days, having milked them in that period six times.[*] On this day (the 18th) he felt the cervical absorbent glands and lymphatics stiff and tender; and on the 20th found a pimple on the temporo-frontal region, which he could not resist scratching. On the day before that, he observed on his finger a red pimple, of the size of a pin's head; the next day, one on the thumb, very small. In neither situation was he aware of the preexistence of any visible wound or abrasion of the cuticle. On the 21st he had head-ache, general uneasiness and pains of the back and limbs, with tenderness and pain in the course of the corresponding lymphatic vessels and absorbent glands, particularly of the axilla, which increased till the 23rd, when nausea and vomiting took place. His right eyelids became swollen, and were closed on that day; but after this period he became better in all respects, never having been confined to the house, although disabled from work. The engravings[†] represent the vesicles as they appeared on the 23rd, when the constitutional and local symptoms were subsiding. The vesicle on the temporal region had a well marked central depression, with a slight crust, a general glistening appearance, and was of a bright rose or flesh colour, with a receding areola; and there was an inflamed, tumid, and completely closed state of the corresponding eyelids.

On the finger[‡] the vesicle was small and flat, with a slightly depressed centre, containing a minute crust.

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[*] The milker who attended in his absence having been vaccinated by Mr. Knight with variola vaccine lymph, (with which I had supplied him,) did not receive the disease from the cows.

[†] See plates 1 and 2.

[‡] See plate 2.

It had a beautiful pearly hue, and was seated on a bright rose-coloured slightly elevated base. On the thumb the vesicle was also flat and broad, but visibly depressed towards the centre, where there appeared a transverse linear-shaped crust, corresponding, doubtless, with a fissure in the fold of the cuticle. The vesicle was of a dirty yellowish hue, and visibly raised on an inflamed circumscribed base. Lymph was obtained from the vesicle on the temple, in small quantity, by carefully removing the central crust, and patiently waiting its slow exudation. In this, as in most other respects, it strikingly resembled the vesicle on the cow, and appeared as solid and compact. The lymph was perfectly limpid, and *very* adhesive. No lymph was taken from the vesicles on the finger and thumb, with a view to avoid any interruption of their natural course.

On the 26th and 27th, when the redness and elevation of the base of the vesicles had materially diminished, the vesicles themselves had become greatly enlarged. On the thumb and finger they were loosely spread out at the circumference, each having a dark and deep central slough. On the temple the margin of the vesicle (as on the cow) was firm and fleshy, its diameter being nearly ten lines, and its centre filled with a dark brown firmly adherent slough. In about seven or eight days, with the aid of poultices, the sloughs separated and the deep ulcers healed, leaving cicatrices like variola, deep, puckered, and uneven, which were seen on the 25th of November. The scar on the temple was nearly as large on the 5th of December as the vesicle represented in the engraving.

Vaccination with the lymph taken from Joseph Brooks.—It was directly transferred to three of his younger brothers, a lad older than himself, and two infants. The primary symptoms in his brothers and the young man, aged 19, were manifest on the seventh day, but were mild. After the appearance of the areolæ, the secondary symptoms were promptly excited, and gradually increased till their decline. There was nothing remarkable in the character of the vesicles till the full development of the areolæ, when they became remarkably broad and flat, spreading outwards, turgid with lymph, bursting their walls, and, like those from which they were derived, followed by sloughs and deep slowly healing ulcerations. In the infants, fine and healthy, with thick compact skins, the usual fretfulness and feverishness appeared on the evening of the sixth or seventh day, remitting in the morning and increasing in the evening, in proportion as the areolæ advanced, and declining with them. As usual, nothing remarkable before the eighth day in the appearance of the vesicles: in one the vesicles burst and sloughed; in the other they remained entire, were fine and satisfactory, leaving characteristic crusts, and moderately deep finely reticulated cicatrices.

In the subsequent transfers of the lymph the effects varied according to circumstances. In infants, with tense thick skins, the vesicles, though active, were perfectly free from inconvenience, yielding fine "tamarind stone" crusts and regular scars. On children and adults, where the skin was thin, vascular, or irritable, upon the full expansion of the areolæ, the vesicles spread out broad and flat, and, yielding to the distending influence of their *diluted* contents, burst and terminated in sloughs, more or less deep, followed by a corresponding extent of ulceration; but where the skin was pale and thick, and especially if the patients were also pale and dark in complexion—conditions in every respect most suitable for the use of *new* lymph—then the vesicles were more compact, restricted, bold, and better defined, with proportionately less areola, and often not distinguishable at any period of their course from those induced by ordinary lymph. Here the crusts were of the ordinary size and form, and the cicatrices of the common depth and extent.

The constitutional symptoms varied not less. In many *infants* the *primary* were scarcely noticed; the *secondary*, proportioned to the texture and vascularity of the parts, the local inflammation, and the temperament of the individual. In *children*, as usual, both were more frequently and more early noticed: the *primary*, on the sixth or seventh day; the *secondary*, at an early period, were marked with vomiting, diarrhœa, much fever, and occasional delirium. In *adults* the same early indications of constitutional symptoms, though not always, were often evinced; and during the *secondary*, as usual, much general complaint was made, some few keeping their beds a day or two. But the primary and secondary constitutional symptoms were comparatively mild in many individuals of the three classes above mentioned.

At the expiration of three months several patients were tested with variola, by inoculation, with no other than a trifling fugitive inflammation at the point of insertion, or a small vesicle resembling the modified vaccine in form, size, and course, containing a *limpid adhesive* lymph, raised on an indurated base, and terminating on the eighth or ninth day in a small, hard, blackish brown crust, and unattended throughout its course with any constitutional symptoms.

Remarks.—The cases of natural vaccine above detailed are interesting in many respects, and we were particularly happy in having to collect the various facts connected with them from persons possessing more than the usual share of intelligence and acuteness of observation. The proprietor of the animals, though occasionally practising as the village cow-leech, had not the remotest idea of the medical theories concerning the nature of the disease, and consequently had no prepossessions in favour of the opinion he spontaneously suggested on first exhibiting his hand to Mr. Knight. He alleged as reasons for this opinion, first, the fact of the state of perfect health in which the cows entered the close; secondly, the existence of variolous effluvia within its precincts; thirdly, the time which elapsed from the exposure of the cows to such influence and the appearance of the vaccine disease on them; and, fourthly, the simultaneous or nearly simultaneous attack of all the patients.* I need scarcely say that we spared no pains in our enquiries as to the validity of the statements in support of this opinion, and the accuracy of the facts upon which they were based. Hence the information here detailed was not deemed admissible till after thorough investigation and minute inquiry, by *repeated personal visits* to the scenes and the sources of it.

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* Both he and the milkers declare that the whole of the cows were certainly affected within less than three days.

There could be no doubt of the existence of variolous effluvia in the site and precincts of the close quite adequate to the propagation of the disease among human beings, had they been exposed; but whether sufficient to excite the vaccine in cows I really cannot pretend to say, having failed myself in attempts to infect *two* or *three* such animals *at a time*, with means not less potent, and under a closer atmosphere. The period at which the disease was stated to have been developed on the six animals was certainly remarkable, and called for careful scrutiny. The result of close and repeated inspections of *all* the cows, both at our first visit and several subsequent visits, was a conviction of the correctness of the alleged simultaneous occurrence of the disease on all the subjects at the time specified, a circumstance which increases the probability of the operation of *one* common cause. And here it is necessary to observe that, although the vaccine disease is sometimes epizoötic, and attacks one or two cows, *at different farms*, about the same time, I never remembered to have seen so many cows simultaneously attacked in one farm as in this instance. Most frequently we find the disease break out on a single cow, and spread slowly, by direct contact of the hands of the milkers, through a dairy. It is also important to add that the vaccine was not then epizoötic in the Vale or neighbourhood, and of this fact I had the best possible assurance. The *aptha epizoötica,* as the disease is called, was then prevailing, and my knowledge of the state of the dairies in general, both from daily inquiries and frequent personal inspection, for the purpose of observing the phenomena of that disease, was more perfect than it had been for at least twenty years; in fact I had altogether despaired of seeing the vaccine disease for some length of time, in consequence of the existence of the epizoötic.

Another circumstance too requires to be particularly noticed in estimating the value of the opinions put forward by Mr. Pollard, and which might be adduced in support of his reasons of belief. It is the fact of the occurrence of the vaccine disease on a young sturk, which of course could not have been induced by those casualties which commonly propagate it amongst milch cows, but simply by the cause which originated the disease in the other five animals, whatever that may have been. The sturk is not considered liable to the vaccine, at least so it is inferred in this neighbourhood, because no one has ever seen the animal affected by it. I have shown however that by inoculation the disease may be communicated to the sturk, and I have also adduced several reasons for its not having been otherwise detected on that animal.* In Germany however I believe it has been, on two or three occasions, seen on the sturk without probable contact. From personal observation I know also that both the sturk and heifer are liable to a vesicular disease of the teats and udder, which is very common on milch cows in this neighbourhood. I have called it the *verrucous* or *wart* vesicle, and shall describe it at a future period. I will merely mention now that, although occasionally these vesicles are as large as vaccine vesicles, most commonly they are far below the average size of them. They commence on the teats or udder as small red vesicles, sometimes scarcely perceptible on a coloured skin, raising the cuticle, with an amber or saffron coloured lymph, which concretes into a solid mass, into the base of which vessels shoot, by which it becomes organized, and continues to augment and grow, as a prolongation of the cutis, in the form of a wart; these warts vary in shape, according to the shape and size of the vesicle from which they spring. Now and then both small and larger verrucous vesicles are covered with a thin flimsy crust, of a light yellowish or saffron colour, never like the solid blackish brown crust furnished by the vaccine vesicle. Hence, although I could not obtain at the time so close an inspection of the teats of the sturk in question as I wished, I could not hesitate to pronounce the crusts vaccine, from the size, shape, and colour. About a month after the occurrences above described, this sturk having been accidentally found in the cow-house, and seeming quiet, was carefully examined by the proprietor's intelligent nephew, who found the teats covered with numerous scars as large as horse-beans, and bearing, as he said, an exact resemblance to those on the other cows. I had an opportunity myself, nine months afterwards, of inspecting these scars, and comparing them with those on the other animals; I could see no difference.

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* *Transactions,* vol. viii., p. 299.

Whatever may have been the source of the vaccine in these animals, the phenomena attending it, so correctly described by the proprietor and the milkers, and the facts observed by us, are very instructive, and need a few remarks. The ages of the cows affected were *two* four-years, and *three* seven-years. Of the three milch cows which remained free from the disease *two* were three-years, and *one* probably four-years-old. That they really did escape was obvious enough, as far as careful inspections, from time to time, of the teats and udders could enable us to declare; and the total absence of any symptoms of indisposition removed all doubt of the fact. Now these three milch cows were shown to have been equally exposed to the same primary cause as the others, and, as we ascertained, were exposed also to the chance of casual inoculation in the process of milking; yet they escaped. These and similar facts, which have often fallen under my notice, induce me to believe that there exists among cows, as well as among men, different degrees of susceptibility to the vaccine. I never recollect to have seen a dairy visited by the disease in which two or three cows, equally exposed to casual infection, have not escaped. Moreover we know, by direct experiment, that some cows may be *vaccinated* or *retro-vaccinated* with facility; others with the greatest difficulty; some not at all. The phenomena of the disease were well described by the milkers. The primary or incursive symptoms so slight as scarcely to attract notice, as is most commonly the case; though in two instances—one some years since, the other more recently—there was considerable precursory indisposition. The heat and tenderness of the teats, with the presence of *small hard pimples, deep in the skin,* which gradually increased daily, with their inevitable and obvious concomitants, *for more than a week* before "blistering" or *acumination,* were not less indicative of the vaccine than the correctness of the observers. At this period—the acme—they notice the constitutional symptoms, developed in all their intensity, and describe them with more than ordinary accuracy and precision; they certainly were more clearly marked than usual. Many contingencies however affect the development of the incursive and secondary symptoms; the chief are the season of the year and the actual condition of the animal, and the quantity and quality of food. The retraction and expansion of the cheeks is not always noticed by the careless unobserving milker; nor is the drivelling from the mouth. This last sign was so well marked that the proprietor feared the animals were about to be attacked by the aphtha epizoötica, (which was then prevailing in the adjoining farms,) where it is one of the first signs noticed, though not actually the first in existence, and depends on positive inflammation and vesication of different parts of the mucous membrane of the mouth. In the vaccine disease however this is not the case, at least here, where the disease is generally mild; for no vesicles are observed in the mouth, nor difficulty of mastication. The drivelling appears to be the effect of topical irritation in the seat of the disease—the teats and udder; for it is very well known that such a symptom does attend similar degrees of irritation from other causes and in other parts. The secondary constitutional symptoms were noticed in all the patients, including the sturk, and were proportioned in each to the amount of topical irritation. It was remarked however that the appetite seemed very little impaired, notwithstanding the wretched appearance of the animals, during the presence of the constitutional symptoms, and the sudden and notable loss of milk. To form some idea of the quantity of milk lost, we ascertained, from the dairy records, that in the first week of indisposition, six pounds of butter were deficient; in the second week, two pounds; in the third week, none. These may be deemed trivial and unimportant particulars, but their utility will be presently shown.

It is hardly necessary to observe that a correct knowledge of the vaccine disease on the cow in its *early* stages is of much importance in many points of view, and that too much pains cannot be bestowed on the minutiæ of the local phenomena by those who are desirous of acquiring the means of a safe and accurate *diagnosis,* if it be important to avoid the inconveniences of propagating from spurious vesicles, or to prevent disappointment when non-contagious lymph is erroneously employed. But to those who think themselves better engaged in investigating the nature and causes of the disease than in hunting after new lymph, a careful study of the latter or ulcerative stage will be not less interesting and productive, and more so than many would probably suspect, though at times it must be admitted the difficulties attending this part of the diagnosis are scarcely to be surmounted with safety and satisfaction. In this place I can only point out the general characteristics of the ulcerative stage, in so far as it is necessary and practicable for comparison at a future period with the ulcerative stage of some other vesicular diseases. It must be obvious that in proportion to our ability to form a judgment for ourselves, *by these means,* concerning the nature and stage of the disease whose history we may be desirous to investigate, and of which we may be able to acquire very interesting facts, in that proportion is our history perfect, and our information valuable. From the nature of things we are indeed compelled to depend too much and too often on the imperfect observations of ill-informed persons, and therefore we should cultivate every opportunity of rendering ourselves less dependant on such sources. The general points of recognition of the vaccine disease in its other stages, as already indicated, being borne in mind, we shall often be able to remark some of their vestiges in the stage of ulceration ; but the extent to which we shall be able to do so, in individual cases, depends upon many contingencies. As there is nothing discriminative in the site, figure, or size of the vaccine vesicle, it will follow that when all vestiges of cuticle and crust are removed, in the stage of ulceration, we can then derive no aid in our diagnosis from the mere consideration of these circumstances. It is true that the distinct or solitary vaccine vesicle never attains the extreme magnitude, nor assumes the irregular shape, not unfrequently acquired and exhibited by some other vesicles in the same parts, but, on the average, falls far below in size, and is most commonly more perfect in form than such vesicles; yet, in many instances, the former are equal in size to some of the latter, and whenever vaccine vesicles are coalescent and ultimately interfluent, or have been closely and thickly grouped with intervening erysipelatous vesications, the resulting ulcerations are of considerable magnitude, and most commonly irregular, and consequently cannot by such characters be distinguished. Our main reliance in forming a diagnosis in the ulcerative stage of the vaccine disease must then be on the phenomena and effects connected with the seat and elementary character of the eruption.

Vaccine ulcers are generally distinguishable by a rounded elevation, more or less manifest, of their outer margins, and a circumscribed induration of greater or less extent, of their base, with a proportionate depression in their centres of deeper ulceration, sometimes caused by a slough. But these characters are obviously influenced by several circumstances which must be taken into account when attempting our diagnosis; the principal are—stage of the disease, texture of the tissues, site of the ulcers. It is necessary to know that in the early ulcerative stage of the severer forms of some other vesicles nearly as much induration, &c., is occasionally found, especially if the texture of the tissues is lax, and much mechanical irritation has been inflicted. If we can be positively assured that the above-mentioned diagnostic conditions have existed in any given ulcer for three or four weeks, or even longer, especially if it be removed from *severe* casualties, we may fairly presume that it is vaccine; and this presumption will be strengthened, if, under the circumstances, the ulcer be small, for such sized and circumstanced ulcers of most other vesicles, being for the most part superficial and sub-epidemic, speedily heal. But as the texture of the parts in which vaccine vesicles appear varies so much, and as their seat is not uniform in depth, and as elevation of the margin and induration of the base and depression of the centres of the consecutive ulcers are sometimes merely questions of degree, (since time or stage is not always determinable,) it is clear that uncertainty in judging of an individual ulcer must now and then happen. Out of this difficulty we often escape by finding a group of characteristic ulcers on the same animal, or a series of animals, clearly infected one from another. And when we have an opportunity of inspecting ten or twelve, to say nothing of thirty or forty subjects, we seldom fail to detect on some of them the elements of a safe and correct diagnosis, as late as the fifth or sixth week. Such condition of parts very rarely occurs in connection with ulcers resulting from other contagious vesicles, except on peculiar subjects, where the subcutaneous cellular tissue has suppurated and sloughed, and the cicatrizing ulcer has a puckered surface and indurated margin. Most commonly this result is confined to the first subject attacked, which continues also to furnish a succession of milder vesicles for four or five weeks. It must be borne in mind however that the vaccine ulcer also is found coexistent with small superficial vesicles or bullæ, both on the teats and the upper, back, and hairy parts of the udder, as in one of the above subjects at Oakley; of the same nature and possessed of the same harmless contents as the vesicles and bullæ which appear (at the acme, or on and after the decline of the vaccine,) on the face, trunk, and limbs of children in high health, and in a few adults with irritable skins.*

These remarks, arising out of the above circumstances, which to my mind are not altogether destitute of interest and importance, will not, I trust, be considered ill-timed or misplaced; and I will merely add that on our visiting and inspecting these cows on the 25th of November following, more than two months after the outbreak of the disease, we found on some of them a few superficial irregular sores, but all character was gone. The scars were pale and smooth.

I must not however, in spite of the length of the above remarks, omit to give a brief statement of what had befallen the above animals between this and our last visit, because the particulars involve pathological facts of considerable value, and, as far as I know, are of some novelty. We were informed that on the 14th of November all the animals, including the sturks, were attacked with the *epizoötic aptha,* which had long prevailed in the Vale, and for some weeks also in the village. The difference in the nature and phenomena of the two diseases was well marked, and the comparative severity of their constitutional effects not less striking. It would be out of place here to enter into a detailed description of the epizoötic aptha; but as there are circumstances attending the development of this disease which contribute to the elucidation of some of the obscurities of the incursive phenomena of the vaccine, I shall in a very few words state the chief symptoms of the former for the purpose of comparison and explanation. This epizoötic seems to be a specific febrile eruptive disease, with catarrhal and rheumatic characters, comprising a cold, a hot, and a critical or eruptive stage. Its invasion is generally sudden. The cold stage is very short—a few hours—*often unobserved;* the stage of febrile reaction is quickly followed by patches of inflammation on the mucous membrane of the lips, gums, cheeks, tongue, and fauces, and about the nostrils and mouth, with congestion of the conjunctiva. These red patches, which are often overlooked or rarely observed, quickly run into irregular vesications or bullæ, containing a limpid pale amber-coloured fluid, and are attended with profuse salivation, difficult and even temporary inability to masticate, with proportionate constitutional disturbance. Similar vesications are often seen on the teats, especially on the involutions of the skin at their apices, also on their bodies.* Still more frequently they are seen on the skin where it joins the claws, as well as on the interdigital membrane, whence they often extend under the horn, creating much mischief and causing excruciating pain by its detachment, &c.; but all these parts are seldom equally affected in the same subject. The constitutional symptoms continue for four or five days, when the topical irritation abates, and mastication is restored. It attacks all ages, and is often suddenly fatal to the very young.† In the milch cow there is a notable diminution of milk, arising, in the first instance, from fever; secondly, inability to masticate—for the appetite soon returns or is not long absent; and, third, topical irritation. Now in the milch cows at Oakley there was this manifest difference in the severity of the constitutional impression produced by this disease—the aptha epizoötica—indicated by the greatly diminished secretion of milk; the quantity of butter lost in the first week was thirteen pounds; in the second week, seven pounds The suddenness of the invasion of the disease, as well as its severity, were demonstrated by the fact that on the morning of the 14th, the day of attack, the usual quantity of milk, "*two bucket-fulls*," were obtained; but, in the evening of the same day, "*scarcely a quart.*" At this time the salivation, erection of the hair, "tucking up of the limbs," &c., were obvious enough, though in the morning—an interval of eight or nine hours—no symptoms of illness were observable. The loss of flesh also was greater, and the animals were longer out of condition; but the season of the year was not without its influence in this respect, as well as in the restoration of the secretion of milk, which was then hopeless.

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* A few months ago I had vaccinated a remarkably fine, florid, plump, vivacious infant, aged eight months, with an active lymph, about eighty removes from the cow. At the acme of the areolæ of the two vesicles nearly the whole surface of the skin of the face, trunk, and limbs, was suddenly covered with large and elevated erythematous patches and spots, which speedily became surmounted with vesicles and *pemphigoid* bullæ of various forms and sizes, exciting considerable and intolerable irritation; but this was not all, for nearly the whole of the mucous membrane of the lips, cheeks, mouth, and fauces, as far as the eye could reach, was affected in like manner; the whole exhibited a most deplorable sight, and certainly not without danger. Five or six weeks elapsed before these vesicles and bullæ ceased to appear, and the child was restored to comparative health and comfort.

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* Inflammation and suppuration of the mucous lining of the milk ducts and reservoirs is not unfrequent, and too often subsequent *mammitis* and all its consequences.

† In these cases of sudden fatality, and in some others of longer duration, the *post mortem* appearances were chiefly excessive pulmonary and cardiac congestion. In an *ox* which survived the acute stage, but wasted with *hæmaturia*, and was ultimately killed, the whole of the subcutaneous cellular tissue was occupied by patches of *purpura hæmorrhagica.* The sub-serous tissues of the lungs and costal pleuræ, and the sub-serous and sub-mucous tissues of the fourth stomach, small intestines, and bladder, were in the same state; liver softened.

In respect to the casual vaccine in the milkers.—It is difficult at all times, for obvious reasons, to determine the precise period of incubation of the disease; and we know also, by direct experiment,* that the stage of papulation is often later in *primary* than in subsequent vaccinations. Judging however by the period of cessation of the *secondary* symptoms, and the decline of the areola on the 23rd, it seems not improbable that, in the case of Brooks, the *primary* symptoms, which were first felt on the 18th, were manifested on the sixth or seventh day of infection. The same may probably be said in the case of Mr. Pollard. Be that as it may however, it is quite clear that in both cases we have again additional evidence of the correctness of Jenner† concerning the mildness of the symptoms, under such circumstances, compared with the secondary or topical symptoms. The vesicle on the temporo-frontal region in Brooks was produced, in all probability, by the casual application of the infected hand during or immediately after milking, or the resting of that part on the side of the cow which he might occasionally have touched in his endeavours to save his milk pail from the restive movements of the animal. He thought he had scratched a pimple on this part; but it appears the pimple in question was really the vaccine pimple. It seems to have run a parallel course with the vesicles on the thumb and finger. It certainly is not necessary that there should have been a visible breach of surface, from what we know in these two cases, and not unfrequently observe among milkers, who not only become infected themselves from the cows, without any known wound, but convey the infection to their wives and families, on whom the results appear on parts where there is no probability of such breach of skin.* The bursting and sloughing of the vesicles on the hand and fingers of the milkers is partly the result of the acrimony of the lymph, partly a consequence of the organization of the tissues affected. I have never yet seen a crust on the hands or fingers of such persons, but always the condition of parts here described. The slough from the vesicle on the temple was the largest I ever saw; but even here the *secondary* symptoms, it will be observed, were by no means severe.

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* *Transactions,* vol. viii., p. 344.

† *Further Inquiry,* p. 90.

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* Not long since I saw a wife and five children labouring under a *pustular* disease of six weeks' standing, and infected by the father, who had caught the disease from the cow, which was in a terrible condition. It was of the character of ecthyma, but communicable, affecting the face, trunk, and limbs, and could be propagated by inoculation.

In the subsequent removes of the lymph we again observe the same mildness of the primary symptoms, and the same average uniformity in the period of their approach, the variable intensity of the secondary symptoms, and the extent to which the special organization of the individual tissues influenced the development of the vesicles, and how much age and temperament, in conjunction with these accidents, determine the amount of the attendant constitutional disturbance. We see also that in some cases it was very difficult to distinguish the local and general effects of the lymph from those of the *variola vaccine* lymph, which was obtained by experiment in February, 1839, and which had been in constant use from that period.

Cases of variolæ vaccinæ occurring in cows and milkers at the village of Dorton.—On Wednesday, the 2nd of June, 1841, my kind friend, Mr. Knight, brought with him to Aylesbury, for my inspection, a young man with two fine casual vaccine vesicles on the left hand, which he had caught from milking some cows at his master's dairy, in the village of Dorton. When Mr. Knight first saw the boy's hand, the day before, he remarked the areola was commencing; and then ascertained that other milkers had been affected, and that the disease had been prevailing in the dairy for some weeks. At the time the hand was presented for my observation, it exhibited a fine specimen of casual vaccine just before the acme, the areola not having arrived at its full expansion. The boy was then under the influence of the secondary symptoms, and being unable to work, I prevailed on him to remain at Aylesbury that drawings might be taken of the vesicles in all their subsequent phases, and the phenomena, both local and constitutional, more carefully noticed, as I had done in the former case of Joseph Brooks; but I must defer the description of the present case of Joseph White till I have detailed the particulars of our visits on the same day and at subsequent periods to the dairy alluded to.

On our arrival at Dorton, about twelve miles to the westward of Aylesbury, at the dairy of Mr. Tompkins, we found cows in all stages of the vaccine disease, and abundant evidence of its existence there for at least three months. It was a large dairy farm, though at the time there were not more than forty-eight cows in milk; and there were three sheds for milking at different parts of the farm. The disease had visited, in succession, all the sheds, and we found that only three milch cows had escaped the contagion, to which all had been equally exposed. It had evidently existed in very different degrees of severity, in different subjects, from first to last; for we found many of the cows which had been attacked at an early period, with much severity, perfectly well, with depressed and puckered scars; and many others, affected at a much later period, with smooth uniform scars; and there were some still troublesome to milk, for the most obvious reasons, that had been ill four and five weeks. A careful inspection of all the animals enabled us to furnish the following particulars as to the state of the dairy, and enabled us, at the same time, to form an opinion concerning the probable duration of the disease therin. We noticed:—

1. *Cicatrices, perfect:* a few irregular, puckered, and uneven, but in general regular and well-defined; oval or circular, of various sizes, some scarcely perceptible, others as large as a chesnut; their outer margins slightly elevated, and gently rounded off, and their bases a little indurated. On a coloured skin the *whole* of these parts were obviously without pigment.

2. *Cicatrices, imperfect:* some irregular and puckered, but most with small, florid, granulating, depressed centres; *imperfect,* with small, bloody, black, thin, flat crusts in their centres; *imperfect,* with small, brown or blackish brown, thin, secondary or tertiary crusts in their centres. In most of these cases the elevation of the rounded margin and induration of the base was generally more marked, especially when large and irregular.

3. *Ulcers, granulating,* of all sizes; others *partially covered* with thin irregular incrustations of a bloody black colour; all having pale, more or less rounded, margins, and hard bases.

4. *Crusts:* large, flat, dark brown, *secondary,* many covering coalescent ulcers; large, flat, dark brown, *primary,* covering interfluent vesicles, with corresponding appearances of the margins and bases; long, oval, thin crusts, not distinguishable from crusts of spurious vesicles, but by the often repeated condition of the margin and base to which they adhered.

5. *Vesicles, passive,* but not desiccated; *passive,* and in progress of desiccation; *passive,* and recently desiccated. Some in all these states on the same animals. *Sizes,* smaller than half a vetch, or larger than an orange pea.

The parts chiefly affected were the *bases* and *bodies* of the teats; around the former, on many cows, the vesicles had been very numerous; on the latter, in many instances, they had been thickly grouped, often confluent. In two cows vesicles were found on the *apex* of the teat; in one of them the inflammation and swelling of the vesicle had obstructed the termination of the milk tube, and caused much pain and difficulty in milking. In several cases there had been large vesicles on the *udder*, near the bases of the teats, many of which, at the time of inspection, were covered with light or dark brown crusts, eight or nine lines in length; some others with thin and secondary and blacker crusts, with characteristic margins. In one of the cows which had been severely affected for not less than six weeks, as was manifest by the swollen and tender teats, full of imperfect and puckered cicatrices, with very hard and elevated margins, surrounding deep, irregular, and waving fissures, we observed a sub-epidermic, half desiccated, half broken vesicle, as large as an almond, containing some light amber-coloured fluid, which was without any elevation or induration of the base, or the slightest degree of tenderness. It had arrived at that stage, in three or four days, from a reddish slightly raised spot or pimple, as had several similar vesicles before it, and as did another about a week afterwards, while the heat and tenderness of the teats continued. After these had subsided no more of these vesicles or bullæ appeared, as far as I could learn. On the farm we observed sturks and dry cows free from the disease, although they had continued to graze and herd with the milk stock during the whole period of its duration. The drivelling from the mouth, the inflation and retraction of the cheeks, "dry rumination," staring of the coat, sticking up of the back, &c., had been noticed in several of the subjects, particularly those which had been severely affected. But no loss of appetite amongst any of them had been observed by the milkers; nor had the proprietor detected any material diminution of the quantity of milk. In this respect, and in the comparatively trifling and temporary influence on the general health and condition of the cows, they afforded an agreeable contrast, in the recollection of the proprietor, with the injury he and most of these cows had sustained by the *epizoötic aptha,* with which they had been affected many months before—about the autumn of the previous year. Here, as in many other dairies, examples of two at least of the evil *sequelæ* of this disease had occurred—protracted lameness and loss of condition from sinuses of the hoofs; and secondly, inflammation and consequent partial or complete loss of the functions of the udder.*

In prosecuting our inquiries relative to the period when the disease was first observed, and as to the subjects on which it probably first arose, we were not so happy as at Oakley. There had been changes and interchanges of milkers; there were three places of milking; there had been changes and interchanges of the animals to and from the three sheds, all creating difficulties which the accustomed carelessness of observation of ordinary milkers did not enable us satisfactorily to surmount. Although the milkers and proprietor all agreed that the disease first appeared in the "home" shed, and was by degrees propagated and conveyed to the cows in the other two sheds, yet some of them frankly admitted that the disease had been in this shed some time before they suspected it, a circumstance which we have before stated as of frequent occurrence. Others thought that they first observed the disease some time in February on three cows which grazed together in a separate close, but were milked in the "home" shed.

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* In several instances of this disease, though the *milk* was greatly diminished in quantity, the *cream* was considered to be relatively more abundant, and the *quality superior.* In other instances however both pus and blood were blended with the milk, probably from inflammation and suppuration of the mucous membrane of the ducts and reservoirs. The former were often obstructed (needing constant attention and relief) by incrustation of their extremities, and pus and blood were often the precursors and accompaniments of the milk.

Now it was curious enough that Mr. Knight had been in attendance on a young man who, arrived from London, had fallen ill with modified small-pox. The patient was sent on the 26th of December previous from his home, situated on this farm, to the parish pest-house, where he remained a month. We could not ascertain, however, whether during that period he had left the house for air or exercise; it was believed that he had not. After this period, and when convalescent, he certainly did go among the cows, and was seen in February at the "home" milking shed. Beyond this, we could obtain no other information that could be relied upon; and the time that had elapsed, added to the circumstances and difficulties above enumerated, made further satisfactory investigation utterly hopeless.

Cases of casual vaccine in the milkers at Dorton.—We found two milkers had received the infection in a mild and modified form, both having been formerly vaccinated.

A man, aged 40, who had been vaccinated twenty years previously, on the present occasion was infected through a puncture which he had accidentally inflicted some time before with a pointed steel instrument. Some swelling and glandular enlargement, with early constitutional symptoms, attended the development of the modified vesicle; but there was no remaining vestige of the latter on our visit. Another man, aged 32, who had been vaccinated thirteen or fourteen years before, had on this occasion some modified vesicles, which gave him very little local or general inconvenience; they also had disappeared before our arrival.

Case of Joseph White, æt. 18; fair complexion, thin skin. Had never before had variola or vaccine. He had not been long engaged in milking at Dorton before he received the infection; he first noticed the pimples on the thumb and dorsum of the left hand on the 25th of May. On the 30th, the sixth day of papulation,* he first felt the mild constitutional symptoms and the axillary swelling and tenderness. The next day these symptoms increased; but on the following day, the eighth of papulation, they abated; yet, as his hand was more painful, and he found himself incapable of work, he called on Mr. Knight for advice. Lymph was then abstracted and used by that gentleman; the areolæ were just commencing. On the 2nd of June, the ninth day of papulation, he came to Aylesbury, when the following appearances were observed. On the side of the thumb,* between the root of the nail and above the last articulation, was a flat vesicle, raised on a hard, red, tumid base. The vesicle was of a dirty white hue, with a slight central *discolouration* rather than *depression,* and a pale red areola extended around the vesicle and beyond the last joint of the thumb. On the back of the hand there was a smaller vesicle, of a different colour and character; it was visibly raised, overlapping at the outer margin, and depressed in the centre, on a less circumscribed but obvious base. The vesicle was of a light flesh-colour; its central crust dark brown, and a moderate light rose-coloured areola, and some tumefaction surrounded and raised the whole. A small red imperfectly vesiculated pimple was seen on the left cheek—noticed by the patient now for the first time. The axillary glands and absorbent vessels were very tender; and though early in the morning the patient felt generally better, in the evening there was increase of all the symptoms.

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* From our inability to determine the precise period of infection, we are obliged to reckon from the earliest period of recognized papulation.

June 3rd, tenth day of papulation.—To-day worse in all respects; both vesicles considerably enlarged, and the areolæ much increased.† There was considerable tumefaction of the thumb and the back of the hand; and the absorbent vessels, highly inflamed, could be traced by the eye into the axilla.

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* *Vide* plate 3.

† *Vide* plate 4.

June 4th, eleventh day of papulation.—The vesicles enlarging; areolæ rapidly subsiding; constitutional symptoms less in the morning, but in the evening augmented; the areolæ then quite gone, but much puffiness of integuments remaining; and some red absorbents still visible on the arm. The vesicle on the face now contains a light amber crust.

June 5th, twelfth day of papulation.—Better in all respects; less tumefaction of the hand, &c.; vesicles expanding. That on the thumb was of a dull dirty white horn-colour, and it had still a dull red areola around the raised and tumid base; the centre of the vesicle, scarcely depressed, was of a dirty yellowish brown colour. On the hand the vesicle was of a dull pearly hue, though rather more glistening than before; it was much puckered at the centre and the margin; the centre was deeply depressed, and contained a small dirty yellowish brown crust. The areola was dull, but brighter than that on the thumb.

June 8th, fifteenth day of papulation.—The vesicle on the thumb* was still characteristic, though it had acquired a vesiccated margin. The vesicle on the hand† was also characteristic, though puffed exceedingly at its circumference. The vesicle on the face was now capped with a hard light brown crust.‡

June 12th, nineteenth day of papulation.—The stage of ulceration was fully developed,§ and the extent of topical disorganization was now sufficiently manifest.

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* *Vide* plate 5, figure 1.

† *Vide* figure 2.

‡ *Vide* figure 3.

§ *Vide* plate 6, figure 1 and 2.

In about a fortnight the ulcers were perfectly healed, leaving scars like those succeeding variolæ or any other disease attended with entire destruction of the corium.

Vaccination with the lymph taken from Joseph White.—Lymph was taken from the vesicle on the thumb on the afternoon of June 3rd, the tenth day of papulation, and at the time the areolæ were declining. The *centre* of the vesicle was opened by displacing a dirty fragment of concrete lymph, when there issued forth a turbid serous fluid. After wiping this away, by repeated dossils of lint, the lancet was directed to the deep centre of the vesicle, where some *tenacious limpid* lymph was found; but it was impossible to extract this unmingled with some of the turbid opaque fluid. Lymph was taken the next day, when the areolæ were nearly gone; it was then chiefly turbid, though the centre of the same vesicle still contained a more adhesive lymph than the circumference, which was avoided as much as possible. After this period no further attempts were made to procure lymph, with a view to avoid damaging the vesicle; though efficient lymph might have been subsequently obtained with the exercise of proper care directed to the central seat and source of it.

The lymph taken on the 3rd was employed on three children, aged respectively three, four, and five years, florid, plump, and in good health; and on a young girl, Sarah Horwood, aged 12, selected for the purpose, with dark hair and eyes, and pale thick skin, but perfectly healthy; she was vaccinated in four punctures.

On the eighth day her vesicles were without areolæ, were of a pale rose-colour, and yielded a *very* adhesive lymph, but in *exceedingly* small quantity. She denied having felt any indisposition.

On the ninth day very moderate pale rose-coloured areolæ; vesicles still but scantily supplied with lymph, yet that is very adhesive. Charged a few points and vaccinated her brother, æt. 2 years, and her elder sister, aged 14. She complains of tenderness, &c., in the axilla, and has some headache, but is up and engaged in straw plaiting.

Tenth day.—States that yesterday afternoon she was obliged to go to bed, and was very bad with headache and general pain all night; but better in all respects to-day. There is nothing remarkable in the size or character of the vesicles; the areolæ have coalesced, very moderate in extent, and of a pale rose-colour. The vesicles are flat, pale rose-colour, and rather brown in the centres.

Twelfth day.—The areola quite gone; very little induration at the base of the vesicles, which are now completely desiccated.

The crusts were very fine, *not large,* but very perfect, and separated on the twenty-first day, leaving a moderate reticulated pit.

The three children vaccinated on the same day as the above patient did not reappear till the fourteenth day, but their vesicles seem to have been moderately active; some were broken, but none were very inconvenient, and little complaint was indicated or made by either of them till the development of the areolæ.

In the cases of *William Horwood,* aged two years, florid, plump, and sanguine, with tense skin; and *Ann Horwood,* aged 14, very dark complexion, pale, white thick skin: in the first, on the ninth day, no visible indisposition; the four vesicles had a bluish hue: in the second no indisposition, five vesicles small, no areolæ. Took very adhesive lymph, which was scantily secreted, and vaccinated her mother.

Tenth day.—W. H.: ash-coloured vesicles on a damask base, areolæ commencing, lymph very scantily furnished; no appearance of constitutional symptoms till the evening, then fever with diarrhœa. A. H.: vesicles pale flesh-colour, small; areolæ commencing; lymph very adhesive, perfectly limpid; topical but not general uneasiness.

Eleventh day.—W. H.: very feverish; diarrhœa; refuses food; deep rose-coloured areolæ; vesicles silvery. A. H.: vesicles pale rose-colour; areolæ coalescent, bright rose-colour; headache and nausea.

Twelfth day.—W. H.: vesicles bright and glistening, one blue, one partly abraded, not remarkable in size; fever, anorexia, and diarrhœa. A. H.: four vesicles burst, one has a bluish tint; areolæ declining; better to-day; engaged in straw plaiting.

Desiccation of the vesicles in the child was late—sixteenth and seventeenth days; but on the elder patient it commenced on the thirteenth day, and rapidly advanced. In the latter case the crusts fell on the twenty-first and twenty-fourth days, leaving shallow striated pits; in the former the irregular crusts fell later, and the scars were larger and deeper.

Horwood, Mrs., æt. 35, fair, florid, thin skin. Fifth day.—Scarcely any signs of papulation; yet, on the seventh day, the headache, pain of the back and limbs, commenced, with fever, and increased till the ninth day.

On the tenth day felt better; has five very fine rose-coloured vesicles, considerable areolæ, and much œdema of the arm, which increased till the eleventh and twelfth days, on both of which days the constitutional symptoms were much aggravated, and bitterly complained of; after this period merely local uneasiness.

Seventeenth day.—Flat dark brown crusts, deeply imbedded in the hard and inflamed integuments; when the crusts separated they exposed the subcutaneous cellular tissue, the corium having sloughed.

Vaccination with the lymph taken from the milker on the 4th of June was performed on two boys, brothers, aged respectively eleven and six, both very fair, with light hair, blue eyes, *red tarsi,* and consequently thin irritable skins. *On each subject* two vesicles were raised with this *"Dorton" lymph,* two with the *"Oakley" lymph,* and two with the *"variola vaccine" lymph.* They all advanced in both subjects, *pari passu,* and could not be distinguished either before or after the eighth day. On the younger boy slight headache arose on the *seventh day.* Both complained of local and general symptoms when the areolæ were extending on the *ninth day.* There was nothing remarkable in the size of the vesicles on the tenth day, when the disease was at the acme, and the areolæ were extensively diffused. Eleventh day: areolæ below the elbows. Twelfth day: the elder boy had a very bad night, arm much swollen and inflamed; the younger a good night, though his arm was as bad as his brother's. After this period the general symptoms abated; but all the turgid vesicles burst the thin cuticle, the corium sloughed, ulcerated, and threw up loose spongy granulations not easily repressed.

From these was vaccinated a younger brother, of precisely similar temperament, complexion, and dermic organization. In him the vesicles were equally indistinguishable at all periods; and as more care was taken to preserve their integrity, though not completely successful in the endeavour, less topical mischief was the result. Scarcely any constitutional symptoms appeared till the tenth day; from this period till the thirteenth they were severe, attended with anorexia, fever, and delirium.

Vaccinations were continued from these sources on a series of fine, healthy, plump infants, and fine active vesicles resulted, with corresponding manifestations of the constitutional symptoms, chiefly at the approach of the areolæ, though not unfrequently a day or two before, always increased at their full development. Then the subjects were favourable and the season was warm; but it was perfectly satisfactory to all who observed them, that no visible difference could be detected between the vesicles or the effects produced by the "Dorton," the "Oakley," or the "variola vaccine" lymph, on the same or on similar subjects.

Remarks.—The occurrences at Dorton, above recited, will afford a fair specimen of the general difficulty which besets investigations connected with the origin of the vaccine disease in a large dairy. The disease, in existence some time before it is suspected by the proprietor or the milkers, has generally extended in all directions before the medical observer casually becomes acquainted with the fact, when he finds the incidents attending its outbreak so imperfectly remembered, carelessly noted, or altogether disregarded, that after all the pains he may bestow on a thorough investigation, he will too frequently conclude with disatisfaction and regret, as far as regards the chief points of his inquiry. Unsatisfactory however as many of these investigations often prove, they can seldom be altogether unprofitable. Many valuable facts are often obtained, to say nothing of the acquisition of greater precision in the diagnosis of the exanthemata of these animals, which is the only safe basis for future successful investigations. Those who cannot conform to the required "toil," may as well abandon the pursuit altogether; they will either be disappointed themselves, or mislead others. Disappointment of some kind, on most occasions of this nature, *all* must expect; errors to a certain extent, in many instances, *few* will escape. Hence the absolute necessity of vigilance, care, and caution, directed by judgment, derived from *personal* experience; and when it is recollected how few are the opportunities which occur to furnish the latter qualification, it must be obvious that we never can safely neglect to make ourselves intimately acquainted with every particular, however trivial and common-place it may at first sight appear. The repetition of our visits is often indispensable, if only for the reinvestigation of our facts ; and experience teaches us that it will seldom be unattended with advantage. We shall often discover new facts, and find it necessary to qualify and correct the old ones ; and at least we shall, by this proceeding, always have the satisfaction of having done every thing that was practicable.

Although our visits and investigations at Dorton were on some points unsatisfactory and inconclusive, yet on others they were highly valuable and very instructive. Here we had an opportunity of observing, on a large scale, the vaccine disease in its later stages, under almost every variety of condition and circumstance ; and were thus enabled to correct, qualify, or confirm former observations, and to make juster comparisons with the corresponding phazes, phenomena, and effects of the more common but not less contagious eruptions on the same parts ; to collect, in fact, additional materials of diagnosis, or acquire increased confidence and precision in their application. The manner in which I have detailed the facts thus obtained, as well as the lengthened observations already made on the Oakley cases, will, I am sure, supersede the necessity of any further remarks in this place ; and I shall now only observe that the *regular* vaccine cicatrix on the cow (though destitute of some of the characters by which it may *frequently* be recognized in man) does often furnish us, when *recent,* with some points by which it may be distinguished from the *regular* and *recent* cicatrices of other vesicles on the same parts. It will be manifest that most of the diagnostic points are involved in those appertaining to the ulcerative stage of the regular and perfect vaccine vesicle, and may, with their exceptions, be safely deduced from that source, due allowance being made for the obvious effects of the progressive changes which time produces and reveals. Hence many of the characteristic phenomena of regular vaccine ulcers may be found in the last stage—that of cicatrization—though of course in a very subdued degree. The *recent irreglar* cicatrix presents the same comparative difficulties as the irregular ulcer, and, *mutatis mutandis,* must be judged by the same means.

The cow in which the *bullæ* appeared in succession, after the decline of the vaccine, had been very difficult to milk, the teats being studded with large deep ulcers, much swollen, and excessively tender, and but imperfectly healed at the expiration of the sixth week. It was therefore not surprising that when these organs, throughout their whole cutaneous surface, were so irritable and congested, such an eruption should appear, and attend the irritating but necessary tractions of the milker. He of course considers these vesicles or bullæ as a continuance of the original disease, though nothing is more manifest than their difference in nature, seat, and course, and that they partake of the character of those vesications which often arise on the same parts when in an inflamed and congested condition from various common causes.

The difference in intensity of the constitutional symptoms and effects of the vaccine disease observed in the dairy at Dorton, as compared with those noted at Oakley, was indicated chiefly in the absence of any signal *general* deterioration of condition of the animals, and in the inability of the proprietor to discover any material loss of milk. Both these apparent discrepancies may, in a great measure, be accounted for from the following considerations:—In the Oakley dairy there was a *simultaneous* attack of nearly the whole *small* milch stock, and the attack was at the period of decline of the milk season, when the cows were daily losing succulent food; hence the secretion of milk would be not only more easily influenced, but its loss more readily detected. In the Dorton dairy, on the contrary, the mode of attack was quite the reverse—probably solitary, or nearly so; and the disease was propagated slowly by contact through a series of forty-eight cows, by the hands of the milkers, at a season too when the condition of the animals was gradually improving by a progressive increase of more succulent food. Here the probable diminution of milk in the early individual cases, often varying from other and obvious causes, could hardly attract much attention in estimating the average aggregate of so large a supply; and the less significant loss in the later cases, as the grass season advanced, would be compensated by an increase of secretion of those which had recovered. But allowance too must also be made for the difference in effect between the *primary* disease at Oakley and the *casual* disease at Dorton.

The outbreak of the *epizoötic aphtha* in both dairies was nearly contemporaneous: at Oakley only a few weeks after, at Dorton some months *before*, the vaccine. These are interesting pathological facts, and at once show the difference in *nature* of the two diseases. Other points of difference may probably be indicated at a future period. But we must not neglect this opportunity of deriving very useful instruction which may serve to guide us in our pathological investigations, particularly in regard to the exanthemata. In the great majority of instances of this epizoötic, though prevailing for many months, we find that proprietors, milkers, and attendants in general of cattle, failed to observe the preliminary stages of the disease—those preceding the critical or eruptive stage. Till the topical symptoms, the salivation, inability to feed, or lameness, were visible, no suspicion of disease existed in their minds. It was only by the intelligent veterinarian that the incursive febrile symptoms and the topical precursors of vesication were ever detected. It is true that the former are of short duration, and the latter are, for the same reason, difficult to detect; yet that both might be recognized by the intelligent and observant was abundantly evident, and is beyond dispute. Here we have another proof of the difficulty of confiding in the uninstructed and unobservant ordinary attendants of these animals, and a striking illustration also of the insidious approach and sudden aggravation of important disease in this class of animals, and of the truth and pathological value of the observations so frequently made, especially in reference to epizoötic and enzoötic maladies, by the most experienced British and continental writers on the subject. "*Enfin,*" says M. Gellé in the conclusion of the able "*Considérations préliminaires,*" prefixed to his valuable but unfinished work,* "*les maladies de ces animaux out presque toutes un caractère trompeur qui en impose facilement aux jeunes vétérinaires. Un calme trompeur, une espèce d' insensibilité, de stupeur même masquent les affections les plus graves, etc. etc. Les maladies charbonneuses et typhoides epizootiques et enzootiques, présentent souvent aussi des symptômes insidieux qui peuvent faire méconnâitre leur véritable caractère, surtout* dans leur principe; *aussi le vétérinaire a-t-il besoin de beaucoup d' experience et d' habitude d' observer ces maladies, pour eviter des erreurs de diagnostic et de prognostic qui pourraient nuire à sa réputation.*"

The facts above mentioned, and the remarks here quoted, must teach us caution in denominating disorders of the bovine species "*topical,*" in which the preliminary indications are seldom or never detected by incompetent observers, especially when we know that both in Europe and Asia the vaccine in a more acute form is attended by palpably incursive symptoms. Our inability to discover the subjects on which the disease first appeared in this dairy, as is the case in too many instances, compels us to be content with the simple statements already made, with these additional remarks: that, before the disease broke out, there was no evidence of ill health in any of the animals; that, from the absence of grass at that season, they were chiefly fed on dry food; and that, as in the Oakley cases, no fresh purchases had been added to the stock, and consequently no infection could have been derived from that source. Subsequent inquiry has not enabled us to trace any direct communication between the small-pox patient and the cows at a time when infection might have been presumed from such a source, upon some individuals at least, out of a large herd of forty-eight cows. The duration of the disease on the farm for more than three months is not difficult to account for, considering the number of cows affected and the circumstances in which they were placed. Of its occurrence, at the latest, in the month of February, not only the testimony of the milkers, but careful and repeated inspection of the cows, leave on the mind of Mr. Knight and myself not the shadow of a doubt.

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* *Pathologie Bovine ou Traité complet des Maladies du Bœuf, par P. B. Gellé, &c. &c., tome 1, p. 43;—Dictionnarie de Médecine de Chirurgie et d' Hygiène Vétérinaires, par M. Hurtrel d' Arboval; Art. Enzootie et Epizootie;*— also *British Cattle,* &c. &c.

I omitted to state that at *Oakley*, Mr. Pollard believed the vaccine had occurred in the village twelve years before. At *Dorton*, Mr. Tompkins had not previously seen it on his farm; but he had resided there only a few years. Mr. Knight informs me that during fourteen years' residence at Brill he has several times seen the disease on the hands of the milkers from the surrounding villages, which are all situated in the midst of a large tract of pasture land, devoted almost exclusively to the dairy.

He assures me also that he has a perfect recollection that on some occasions the small-pox and the vaccine have been coexistent, in others the latter has immediately succeeded the former. In this village of Dorton, for example, the small-pox and cow-pox were *coexistent,* and *endemic,* and *epizoötic,* in the latter part of the year 1831, at which period the cow-pox was not known to prevail in the other villages. The small-pox had been in the village for some time, and was supposed to have been introduced, by infected clothing, from a distance. About the latter end of December of that year, the weather being mild and moist, both diseases were in existence on this *identical farm* before Mr. Tompkins was the occupant.*

Both Dorton and Oakley partake of the general topographical characteristics of the Vale of Aylesbury,† at the western extremity of which they are situated, forming part of an extensive dairy district. The former is rather more than a mile to the southward of Brill, the latter about two miles to the south-west; both are placed at the base of the immense triple hill on which Brill is erected, and from which there is a grand, enchanting, and extensive prospect. The soil of both villages is heavy and tenacious, yet there are some particulars in which they differ. *At Oakley,* under a thin stratum of vegetable matter, lies a stiff clayey loam, about two or three feet deep. In some places gravel and loose rubble are also found. Immediately underneath lies the *impenetrable* dark blue clay. There are several chalybeate springs in the village; a very powerful spring mingles its waters with the the drainage of the village at the south-west; but these springs are far inferior to those at Dorton. Besides other fossils, at a depth of one hundred feet, multitudes of pyritic ammonites have been brought up. *At Dorton,* although there is the same general character of the soil, based upon the unfathomable blue clay, there are several very interesting points of difference in certain localities. This village has within the last four years risen into considerable repute from the existence of a powerful chalybeate spring, which has been wasting its waters in the precincts of the village from time immemorial. It would seem to be unrivalled in England, and inferior only to that of Toplitz, in Germany. The following analysis by Professor Brande will not be uninteresting. In an imperial pint are contained—

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* On this occasion the small-pox occurred in a cottage on the farm. In the family affected, one of the members, a milker, had just recovered from the casual vaccine; he slept with those members of the family who had the small-pox, and was also inoculated with it, but with no other result than slight topical irritation and some fever for about a day's duration.

† *Transactions,* vol. viii., p. 290.

Carbonic acid	a trace.
Nitrogen gas	
Sulpuric acid	
Silica	
Sulphat of lime	11.5
Muriate of soda	1.4
Sulphat of alumine	2.1
Sulphat of iron	10.
	25 grains.

It reddens vegetable blues from a slight excess of sulphuric acid, which amounts to about 0.8 per cent.

The imperial pint yields an evaporation of twenty-five grains of dry saline matter. The specific gravity of the water at the temperature of 60° is 1004. The well is situated in the corner of a meadow adjoining the grounds of Dorton House, near the bottom of the hill, where a handsome and spacious pump-room is erected. To the distance of twelve acres around the well the following is the character of the superficial and deeper seated soil. Within a foot it is loam, thickly interspersed with shattered shells, inclined to moulder; still deeper by another foot, clay—short, unctuous, and friable—in layers, each layer having an intermediate body very like precipitated sulphur, or more properly "*lac sulphuris,*" to which it answers in smell and colour; numberless crystals of gypsum; and thick patches of moist brown accumulations of iron pyrites. This extends to the depth of sixteen feet. The water given up by the spring is upwards of ninety gallons per day. Dorton lies about five miles and a half north-west of Thame; twelve miles north-east of Oxford; and fifty miles from London.

In respect to the effects of the lymph obtained at Dorton.—The lymph taken from the milker on the 1st of June, just as the areolæ were commencing, Mr. Knight informed me, failed to produce any effect on some younger members of Joseph White's family and another eligible subject. With me the lymph taken on the 2nd and 3rd of June succeeded in every subject, not more than two *punctures* failing, which may be in a great measure attributed to the precautions taken in abstracting it,—precautions which are often necessary and successful in the employment of natural and casual vaccine in cows and milkers. By this method we may often succeed, in very distant removes, with *active* lymph, especially on subjects with substantial *moderately* vascular skins and *compact* cellular tissue, even as late as the twelfth day, or after the decline of the areola; and *always* when the lymph, in the deep centre of the vesicle, is *quite limpid* and *thoroughly adhesive.* But such proceedings under ordinary circumstances are not to be recommended, for disappointment is not always the only penalty. There can be no question that the lymph of some subjects is more active and efficient at the tenth, eleventh, and even the twelfth days, than that of some others at the eighth day, and that *perfect limpidity* and *viscidity* or *adhesiveness* are infallible indications of the fact; yet I should be the last to impugn the general truth of the remark that the earlier is the more active lymph, or that there is anything but prudence, propriety, and advantage, in the general rule of taking lymph on the eighth day, or before any material amount of areola is present.

From the lymph of the Dorton milker (as well as many others I might mention at the same stage) the resulting vesicles were perfectly normal, varying only as above described, according to the quality of the tissues in which they were generated, affording another proof—if indeed such were needed—that the activity or acrimony of such lymph is not manifest on all subjects, but that in *many* instances neither the local nor constitutional effects appear to differ from those induced by good lymph which has been some time in use; and, lastly, that we have no better standard of comparison of the local and constitutional symptoms of efficient vaccine than that originally furnished and so beautifully illustrated by Jenner—a standard to which we may at all times confidently appeal.

Within the last three years I have had occasion to observe and note the local and constitutional effects, on a variety of subjects, of more than *fifteen* different stocks of vaccine lymph, of which *six* have been direct from the cow or the milkers, and *seven* artificially produced on the cow. They have all varied in their effects, both locally and constitutionally, according to the circumstances so often alluded to; but none have lacked the essential qualities and properties, nor have any possessed them in a superior degree, to those indicated in that description and those illustrations which I have just mentioned. I have seen also as much local inconvenience, in some subjects, from the *oldest* as from the *newest* lymph.

Here I will beg to remark that the comparisons which I have thus been enabled to make with the *variola vaccine* lymph—some of which have been detailed and illustrated in my former communication, others in this—may be deemed by many, as they are by myself, to afford sufficient proofs of the identity of this lymph with genuine vaccine, particularly when so many practical observers, both in England and on the continent, have had opportunities of comparison, by employing it on many thousand subjects. But I think it right, for the satisfaction of others, to state that the variola vaccine lymph has been submitted to the test of variolous inoculation on twenty-two subjects, at various periods, after vaccination. In order that a fair parallel may be presented of the effects of this test, it will be convenient and necessary to adduce authentic descriptions of the results of variolous inoculation after vaccination at a corresponding period—within three years, as furnished by the records of the time when such test was deemed necessary, and was employed for the Jennerian lymph. Dr. Willan* has not only furnished us with many details of such cases, but has drawn up a concise summary of the results of variolous inoculation at different periods after vaccination. This I shall perhaps be allowed to quote, although his coloured illustrations will be found very interesting and necessary to be referred to. "The most frequent result," he observes, "of variolous inoculation after vaccination is a small pustule,† not attended with disorder of the constitution; but some of the following circumstances and appearances take place after it in particular constitutions:—1. A pustule resembling those exhibited,‡ but having in some cases a more diffuse inflammation or efflorescence around it. 2. Slight febrile symptoms, such as a pulse somewhat accelerated, a whitish fur on the tongue, languor and heaviness, but without any eruption. 3. A red efflorescence on the skin, which continues for a day or two. 4. Febrile symptoms for two days, attended with an eruption of some hard minute pustules, which usually disappear in three days. 5. Purpura or petechiæ sine febre on the seventh day after inoculation."

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* *On Vaccine Inoculation;* London, 1806, p. 69.

† Plate 1, No. 2, *ibid.*

‡ Plate 1, No. 5, *ibid.*

Dr. Willan adds "that similar symptoms take place after small-pox in persons who have been inoculated with variolous matter, *especially in children* of an irritable constitution who have a *delicate skin*."* Of such he quotes and details several instances, adding, "These, with other similar cases on record, should warn us against the indiscriminate use of variolous inoculation as a test of the correctness of vaccination, or for any other purpose.†"

Dr. Jenner mentions similar facts;‡ and in his very interesting paper,§ detailing two cases of

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[*] Do we not over estimate the results of revaccination in many subjects, *particularly children*, who often appear *especially* susceptible of its influence?

[†] To this I may add that I have seen variola propagated by the short and trivial fever induced in a child by variolous testing. The child had no eruption; a small vesicle, like a modified vaccine vesicle, on the arm, with some areolæ on the eighth day, with a few hours' fever, and no subsequent inconvenience. The mother, who had been vaccinated twenty-three years before, was evidently thus infected, and had a mild varioloid attack. We see therefore that not only the *limpid* and *adhesive lymph* of these "*test*" *varioloid* vesicles will produce variola by inoculation; but that the *fever*, though slight and fugitive, which sometimes attends such "testing" is occasionally specific and infectious. But these warnings *now* are needless; the 3rd and 4th of Victoria, c. 29, will doubtless altogether supersede them.

[‡] *Further Observations on the Variolæ Vaccinæ*, 1799;—also *Continuations of Facts and Observations on the Variolæ Vaccinæ*, 1800.

[§] *Medico-Chirurgical Transactions*, vol. i., 1809, p. 269.

small-pox conveyed to the fœtus in utero, the parents at the time being free from variola, (by which he endeavours to show that the *continued* susceptibility to variola remains in all through life, though in all it is not equally manifested) remarks, "My principal object in the foregoing observations is to guard those who may think fit to inoculate with variolous matter, after vaccination, from unnecessary alarms: a pustule may sometimes be thus excited, as on those who have previously undergone small-pox; febrile action in the constitution may follow, and, as has been exemplified, a slight eruption."*

At a very early period after the production of the variola vaccine lymph, I had an opportunity of testing *both stocks* by variolous effluvia, having to vaccinate several children who were living and sleeping in the same rooms with patients labouring under variola, and in every instance the vaccinated escaped. Very soon after the introduction of the second stock of lymph into use at the Small-pox and Vaccination Hospital in London, Mr. Marson very kindly tested one patient, soon after vaccination, by variolous inoculation, without any local or constitutional result. Subsequently to that time I have tested twenty-one patients at different periods, the chief particulars of which will be found in the following table.

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* See also *Medical and Physical Journal,* in 1803-4-5, &c.;—Dr. Labatt's *Address to the Medical Practitioners of Ireland on Vaccination,* &c. &c., p. 103.

Table showing the sex, age, period after vaccination with variola vaccine *lymph, number and kind of scars, and results of the test of variolous inoculation of twenty-one subjects.*

No.	Sex.	Age.	Period after vaccin.	Number and kind of scars.	Results.
		Years.	Months		
1	Girl	11½	5	8 very fine scars	Two papulæ from the 3rd to 5th day, then declining; 6th, gone.
2	Girl	8½	5	5 very fine scars	Three papulo-vesicular elevations on the 4th day; declining on the 5th day; desiccating on the 6th day; dark brown crusts on the 7th day.
3	Boy	8½	5	2 large, 2 small	Two papulo-vesicular elevations on the 5th day; declining on the 6th; desiccating with brown crusts on the 7th.
4	Girl	8	5	4 fine scars	Two papulo-vesicular elevations on the 5th day; enlarged, with slight areolæ, on the 6th; small silvery white vesicles, with bright red areolæ, containing a few drops of limpid adhesive lymph, on the 7th; bluish vesicles, with pulsating areolæ, on the 8th; declining on the 9th; desiccated on the 10th.
5	Boy	7½	5	4 fine scars	Two papulo-vesicular elevations, enlarging with tawny jagged areolæ, on the 6th; declining, with yellowish brown crusts, on the 7th; incrusting on the 8th; small brown crusts, like modified vaccine, *forcibly* removed on the 12th; numerous hard warty papulæ on the face, trunk, and limbs, on the 14th; several suppurated on the 16th day; all decadent on the 18th. Very slight fever for a few hours at commencement of eruption.
6	Boy	7½	5	3 small scars	Three papulo-vesicular elevations on the 7th day, with small areolæ; took a few drops of adhesive limpid lymph; declined on the 9th; yellowish crusts on the 10th.
7	Boy	1½	5	4 very fine scars	Two papulo-vesicular elevations on the 5th day; large glistening vesicles like vaccine on the 7th day, with small areolæ; pale flesh-coloured vesicles, with patches of brown crust on hard bases, on the 8th; very fine vesicles (like vaccine of the 14th day) this 9th day; "tamarind-stone" crusts on the 10th day.

No.	Sex.	Age.	Period after vaccin.	Number and kind of scars.	Results.
		Years.	Months		
8	Girl	4	12	4 small scars	Three papulo-vesicular elevations on the 5th day; increasing with areolæ on the 6th; declining on the 8th, with minute brown crusts.
9	Girl	7	13	4 good scars	Three papulo-vesicular elevations on the 5th day; with areolæ on the 6th; and limpid adhesive lymph on the 8th; declining on the 9th, with yellowish brown crusts.
10	Girl	6	13	4 good scars	Precisely the same.
11	Girl	4	13	4 very good scars	Nearly the same; but vesicles larger with more areolæ on the 8th day, with a few hours' fever and pain in the arm; all declining on the 9th day.
12	Boy	11	14	4 fine scars	Trivial fugitive inflammation for two days.
13	Girl	7	26	2 good scars	Two papulæ on the 4th; on the 6th gone.
14	Girl	2½	29	4 fine scars	Two papulo-vesicular elevations on the 6th day, with slight areolæ; declining on the 8th; desiccating with brown crusts on the 10th day.
15	Girl	5	29	2 small scars	Two papulo-vesicular elevations on the 6th day; with slight areolæ on the 7th; declining and desiccating on the 8th and 9th days.
16	Boy	4	29	1 small scar	Two papulo-vesicular elevations on the 5th day; slight areolæ on the 6th; declining on the 8th; encrusted on the 10th.
17	Girl	5	30	2 small scars 1 large scar	Two papulæ on the 6th day; vesicular on the 7th; ash-coloured vesicles on the 8th, on dark red base; decadent and encrusted on the 10th day.
18	Boy	5	30	1 fine scar	Two vesicular tubercles on the 5th day, with areolæ; encrusted on the 7th day.
19	Boy	2½	30	1 fine scar	Two fugitive inflamed spots; 6th day, gone.
20	Girl	17	30	5 good scars	Four small tubercular vesicles on the 5th day; decadent on the 6th day, no lymph; 9th day, brown crusts.
21	Boy	14	31	5 fine scars	Two vesicular tubercles on the 6th day, with areolæ; advancing, with pain in axilla and head, and slight fever, on the 8th day; rapidly decadent on the 9th day; with brown crusts on the 10th.

Observations.—The boy, 5, was the only patient on whom any eruption appeared. It was of the form described by Willan in the above summary (4),* for it partook of the double character: hard elevated papulæ; hard elevated papulo-vesicular eminences, some desiccating, some rapidly suppurating, all disappearing on the fourth day. The vesicles from inoculation having encrusted, like modified vaccine, the crusts were removed before the skin was sound; and two days afterwards he was shown to me in the state described. He had had no indisposition at any period of the testing process, but seemed rather hot just before the eruption; but was cheerful, and with reluctance kept within doors, taking his accustomed diet. The greater part of the eruption resembled the vesicular lichen occasionally seen after vaccination. This boy had four remarkably fine vaccine vesicles; but never showed during their rise, progress, or decline, the slightest constitutional disturbance, not even acceleration of the pulse. The child, 7, was brother to the above. The test vesicles were very fine, and could not be distinguished from large modified vaccine vesicles; he had no fever; his vaccine vesicles were remarkably fine, and the constitutional symptoms were well marked. Both patients had very clear florid skins. The children, 9, 10, 11, were of one family; all had clear florid skins, on which their vaccine vesicles had been beautifully developed. No. 11 had the finest vesicles, and suffered most from fever; she indicated also most influence from the variolation, but had no eruption; the others had no fever. The girl, 15, had but *one* good variola vaccine vesicle; she was vaccinated direct from the *first* variolated sturk,[*] and had scarcely any indisposition; but was tested with Bryce's test with a satisfactory result. The boy, 16, was vaccinated from the same *direct* source; he was attacked with gastro-intestinal fever soon after vaccination; his only vaccine vesicle rose very tardily and languidly, but ultimately acquired a large size.[†] The subjects, 18 and 19, soon after vaccination from the early removes of the second variolated sturk,[‡] were attacked with fever of dentition, and one retarded small vesicle only rose on each. The boy, 21, had shown early and well marked symptoms from his vaccination—the second remove from the second variolated sturk. He complained of pain in the arm and axilla from the test vesicles, had distinct fever and slight loss of appetite from the seventh to the ninth day, but stated that his symptoms were *trifling* compared with those which he felt from the vaccination.

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* *On Vaccine Inoculation,* Plate 2, No. 6, and Plate 2, No. 2.

In none of the other cases was there the slightest constitutional disturbance, the patients running about and playing with their companions, eating and drinking, and enjoying themselves in all their accustomed ways, unconscious, like their friends, of the nature of the process to which they were subjected, and insensible of anything but topical trivial inconvenience. No suspicion could arise in the mind of any one, for it was impossible to distinguish the vesicles when they did appear from modified vaccine of different degrees of perfection, the limpidity and adhesiveness of the few drops of contained lymph, and the small dark brown "tamarind-stone" crusts, when the vesicles were unbroken and unirritated, deceived several medical men to whom I exhibited the patients. Under the microscope the concrete lymph exhibited the beautiful reticulated appearance said to be characteristic of efficient vaccine.* But I have seen this and the *linear* appearance, mentioned by the same author, in the *concrete* lymph of the *verrucous vesicle* of the cow before alluded to.† The variolous matter employed was recent, taken on the sixth and seventh day, perfectly limpid, and some from the confluent and malignant variety; it was taken in tubes, or dried on *large* "store" points, repeatedly charged. In applying the test, clusters of superficial scratches were made on the skin, over an area as large as an orange-pea or a horse-bean, from two to four such patches on each patient; the variolous lymph was then discharged from the tubes, or rubbed off the points on the abraded surface.‡ In *every* instance *some effect* resulted, as above described.

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[*] *Transactions*, vol. viii., p. 382. [†] *Ibid*, p. 404. [‡] *Ibid*, p. 385.

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* *Recherches microscopiques sur la composition du fluide vaccin, par M. Dubois, (d'Amiens.)—Bulletin de l'Academie Royale de Médecine, Avril* 30, 1838.

† See page 18.

‡ This method is adopted by many in vaccinating. It is, as pointed out by Mr. Estlin, of Bristol, the only sure mode of successfully vaccinating with dry lymph which has been kept some time. He recommends broad and long points—(*Medical Gazette,* December 27th, 1839,)—to be *repeatedly* charged from good vaccine vesicles, *from time to time,* and carefully excluded from the air. When required for use, the lymph may be carefully rubbed off on such clusters of scratches by the aid of the serous or slight sanguineous exudation therefrom. By this means I have repeatedly revived the variola vaccine lymph after three, four, six, and nine months, in all its potency. "Store points," thus properly charged from *good and early lymph,* (not the draining of vesicles,) may form an efficient substitute for crusts, and are more convenient. Some of Mr. Badcock's *variola vaccine* lymph—(*Brighton Herald,* March 20, 1841,)—with which he kindly favoured me, I thus revived, in admirable perfection, after four months. It was wrapped up in gold-beater's skin, and enclosed in tin foil. I usually roll mine up in cotton wool, and enclose it in a small corked phial full of the same material.

I need scarcely say that I did not venture to use any of the limpid adhesive lymph from the *variolous test vesicles* on subjects which had not undergone vaccination; but I did, in three or four instances, employ it on the same arm with the other variolous matter. It was clearly possessed of inferior power; for while the latter was capable of exciting a papulo-vesicular result, the former or modified lymph scarcely excited on the same arm more than a slight fugitive inflammation, or a hard, red, lymphless tubercle. These experiments, though necessarily limited by time and circumstances, it is presumed will suffice to prove the main point for which they were instituted, and thus furnish the only remaining evidence required to establish the identity of the *variola vaccine* artificially obtained and the vaccine naturally or casually yielded by the cow.

General and concluding observations.—In the foregoing cases, as well as in many others embodied in my former "Observations," it will be seen that endeavours have been made, not only to acquire information relative to the phenomena of the casual vaccine, but to accumulate facts illustrative of the pathology and œtiology of the disease in its primary form. That for this purpose, especially, the course of inquiry has necessarily been directed to the investigation of facts bearing on the age, state of health, condition, and circumstances of the animal or animals affected; the character of the incursive, eruptive, and secondary symptoms of the disease; the season of the year, and the state of the weather when it has been observed; the nature and character of the soil, and the condition of the pasturage where it has been found. Whether sporadic, epizoötic, or enzoötic; whether prevalent during epidemic or endemic variolous conditions of atmosphere; whether clearly or presumably traceable to the direct contagion or infection of human variola. But no one can be more sensible than myself of the small amount of positive information at present obtained from this locality on many important points of this enquiry, and of the utter inadequacy of these *contributions* to furnish more than a mere fragment in the history of the subject. But if they were far more extensive and complete than time and circumstances and the various difficulties so often indicated and deplored have allowed, they would still be insufficient for such purpose; for it must be manifest that the history of this disease cannot be complete unless it embody the results of the most comprehensive investigations, made under far better auspices, in various localities, in other countries, and in different climates. Hence it is greatly to be desired that members of our profession, favourably situated, should earnestly direct their attention to the subject, and emulate the practice of many distinguished human and comparative pathologists on the continent, and some of our brethren in the East. Comparative pathology has engaged the attention of the most eminent human pathologists of ancient and modern times, with acknowledged benefit to humanity and unquestionable advantage to science; and it is truly gratifying to know that talents and attainments of the highest order are at this time directed to these pursuits, at once furnishing incontestible evidence of their interest and importance, and conveying the best assurance of eventual success. "*De même que l'anatomie et la physiologie comparées,*" say the distinguished pathologists alluded to,* "*jettent une vive lumière sur l'anatomie et la physiologie humaines, de même l'etude des maladies chez les animaux servira à dissiper bien des doutes et des incertitudes qui regne encore dans la pathologie de l'homme.*"

If comparative anatomy be necessarily allied to that of man, if the relations of organization that exist between all the mammalia establish between the larger animals and the human species evident analogies in all the physiological and pathological changes which take place, comparative pathology must offer results highly useful to the study of general medicine. The knowledge of the diseases of animals, when it becomes more advanced, will contribute to diffuse new light on the diseases of man, and perhaps bring to perfection methods of cure or prevention, owing to the facility of multiplying on the inferior animals experiments which we cannot attempt on man. These sentiments, expressed by one of the ablest and most accomplished of modern veterinary practitioners and writers,† are well worthy of our attention, and it is hoped that their correctness may be abundantly established by the zeal and ability of enlightened pathologists of the present era; and although the genius and patient research of a Jenner may be required for the complete realization of all these hopes, yet in so ample a field there are few who may not be usefully and advantageously occupied. In the department of comparative pathology, comprehending the exanthemata, much remains to be accomplished, notwithstanding its diligent and successful cultivation in some parts of the continent since the time of Jenner. What has hitherto been effected there cannot suffice however to supersede, much less to paralyse, the efforts of his countrymen. But they must arouse themselves, and no longer exhibit a practical indifference to the researches to which he so successfully devoted the energies of his great mind. A comprehensive study of the exanthemata of the mammalia, especially of the bovine species, is not less essential to a correct diagnosis of the vaccine disease, than to the formation of a just estimate of its nature and causes. It is greatly to be lamented that, in England at least, veterinary instruction is generally confined to so limited a range, and that, of course, so little is conveyed relative to *general* pathology, and particularly in those branches which relate to the history of epidemics and human exanthemata. On the other hand, it is not less to be regretted that a comprehensive knowledge of comparative pathology is not made an integral part of a sound medical education.

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* *De la Morve chez l'homme, chez les solipèdes et quelques autres mammifères, par MM. Breschet et Rayer.—Bulletin de l'Academie Royale de Médecine, le* 10 *Fevrier,* 1840.

† *Dictionnaire de Médecine, de Chirurgie, et d'Hygiène Vétérinaires, par M. Hurtrel d' Arboval. Tome deuxième; Art. Epizootie.*

It has been well observed by the author above quoted, in an able and enlightened article on this subject:* "*Nous croyons qu'on ne s'est pas encore assez occupé de la vétérinaire sous le rapport de la médecine générale et comparée, et que lorsqu'on se sera livré à ce genre de recherches et d'études avec* *tout le soin, toute l'attention, et la persévérance nécessaires, on pourra découvrir des analogies qu'ont échappé jusqu'ici à toutes les investigations.*" Such interchange of knowledge would be reciprocally advantageous, and productive of incalculable advantages to the sister science. Many of the difficulties which at present attend the formation of a generally satisfactory theory of the vaccine influence appear to me to admit, and likely eventually to receive, a more complete solution from comparative pathology than some persons are disposed to expect or believe. It behoves us at all events to prosecute these and analogous enquiries to a successful issue, aided by an attentive consideration and careful study of the valuable information which modern veterinary medicine is now capable of affording. The rapid advances which this science has made of late years, the zeal, the learning, and the ability, now devoted to its cultivation, are not only highly creditable, but must prove equally beneficial to science and humanity. Hence we are encouraged to believe that the hopes so fervently and so eloquently expressed by the late M. Hurtrel d'Arboval may at no distant period be amply realized:—"*Espérons que des hommes instruits, profitant de l'analogie qui existe entre les propriétés organiques et vitales de l'homme et des animaux, parviendront un jour à transporter dans la vétérinaire les faits et les documens qui servent de base à la médecine humaine, et que leurs efforts parviendront à reverser sur celle-la les trésors de celle-ci, en comblant quelques unes des lacunes qui restent encore dans notre art.*"

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* *Dictionnaire de Médecine, de Chirurgie, et d'Hygiène Vétérinairés. Tome sixième; Art. Vétérinaire.*

EXPLANATION OF THE PLATES.

PLATE I.

This plate is referred to at page 11; it represents the casual vaccine on the right temporo-frontal region of Joseph Brooks, with recedent areola. With the exception of being rather more florid, it very much resembles the vaccine vesicle on the white skin of the cow's udder, and, like that, yielded lymph only from its centre, and that slowly and scantily, after the removal of the central crust.

PLATE II.

This plate is referred to at pages 11 and 12; it represents the casual vaccine vesicles on the thumb and finger of the same individual, on the same day, as that of the preceding plate.

PLATE III.

This plate is referred to at page 37; it represents casual vaccine vesicles on the hand and thumb of Joseph White on the 2nd of June, 1841, from Dorton.

PLATE IV.

This plate is referred to at page 37; it represents the casual vaccine vesicles on the hand and thumb of the same individual, but a day later than those depicted in the preceding plate. The vesicle on the thumb is still flat on the surface; but the centre is more discoloured, yet without any visible depression; the central crust has increased. The vesicle on the hand is much more depressed in the centre, and the bases of both vesicles are more elevated.

PLATE V.

This plate is referred to at page 38; it represents the casual vaccine vesicles on the thumb, hand, and face of the same individual, in a more advanced stage than those in the preceding plate.

Fig. 1. The vesicle on the thumb, with a portion of slough visible through an opening in the bluish or slate-coloured centre, the margin partially vesicated, the base flatter and duller.

Fig. 2. The vesicle on the back of the hand, irregularly puffed at its margin, puckered and depressed at its centre, where the slough is visible.

Fig. 3. A small flesh-coloured vesicle, containing a light brown acuminated crust, situated on the left cheek. It was first noticed on the 2nd of June—seven days before—and in all probability arose from a *late* casual application of lymph to the part affected. Similar vesicles are often seen on the cow.

PLATE VI.

This plate is referred to at page 38; it represents the ulcers on the thumb and hand, resulting from the casual vaccine vesicles of the same patient, as are depicted in the three preceding plates.

Fig. 1. The ulcer on the thumb, not very deep, and granulating.

Fig. 2. The ulcer on the back of the hand, deep, and not yet granulating, surrounded with a well-defined, elevated, and indurated border. Both these ulcers exhibit some of the characters pointed out, at page 23, as worthy of attention in discriminating the eruptions on the teats and udder of the cow at a late stage.

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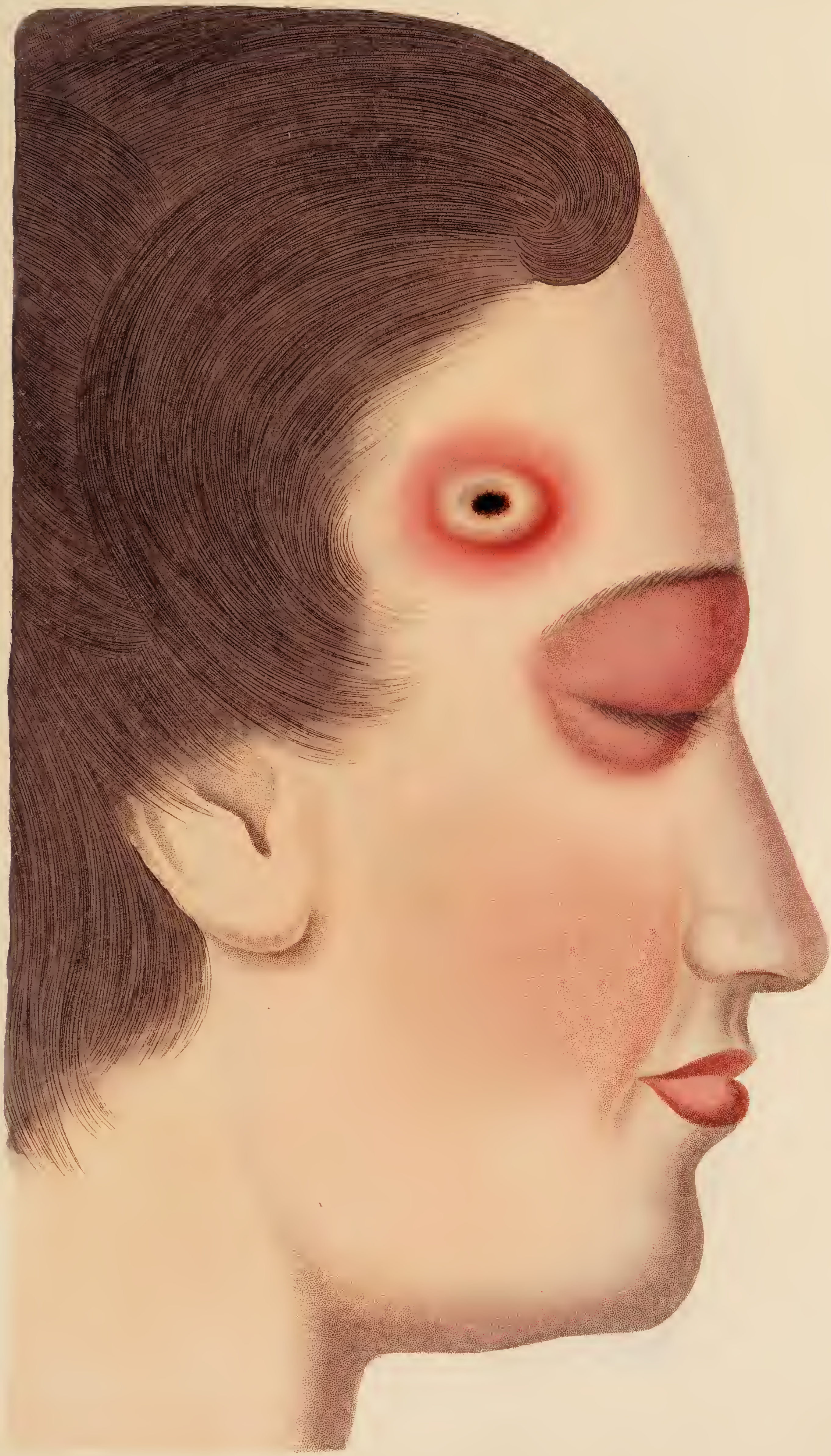
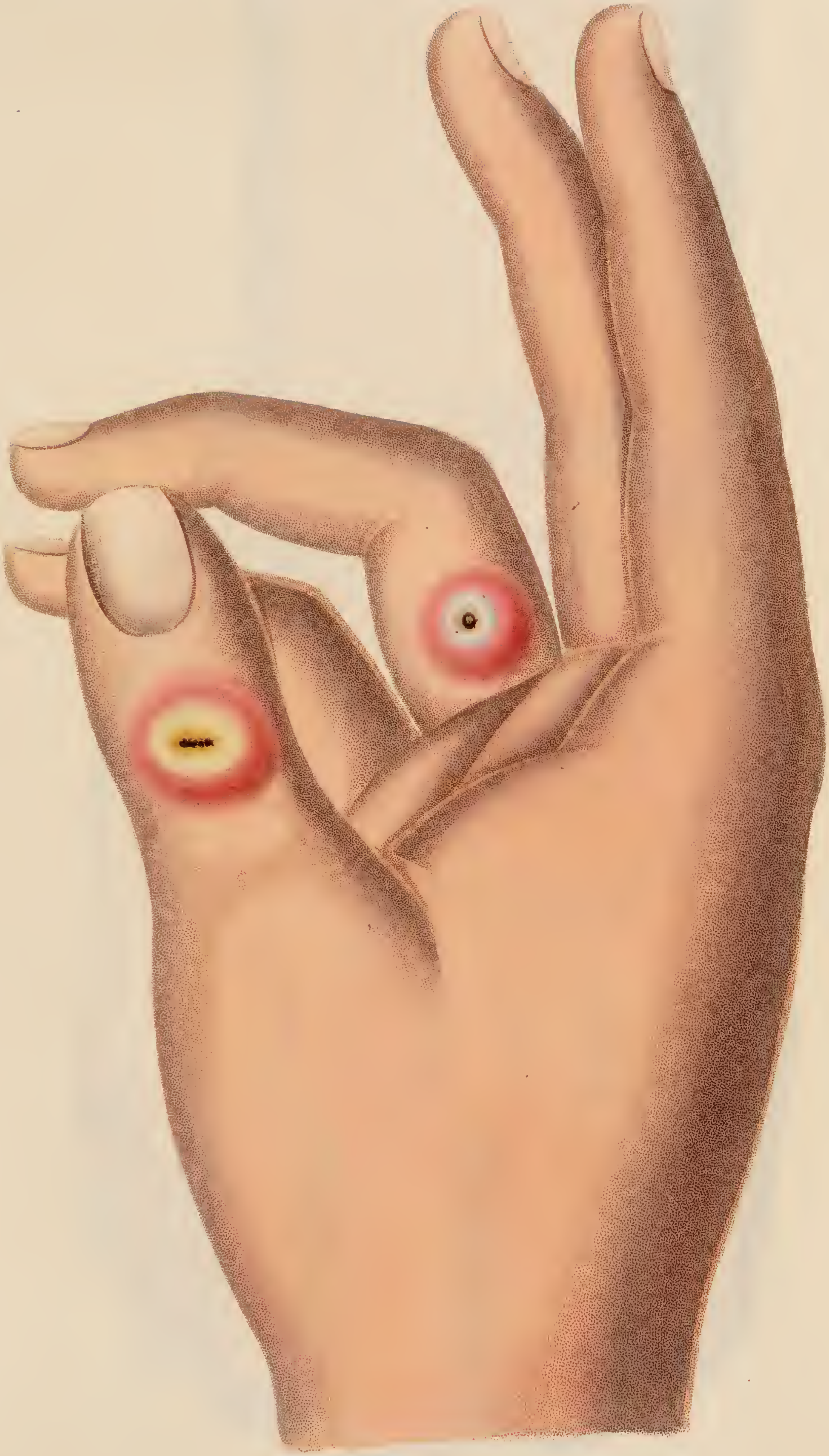


PLATE D



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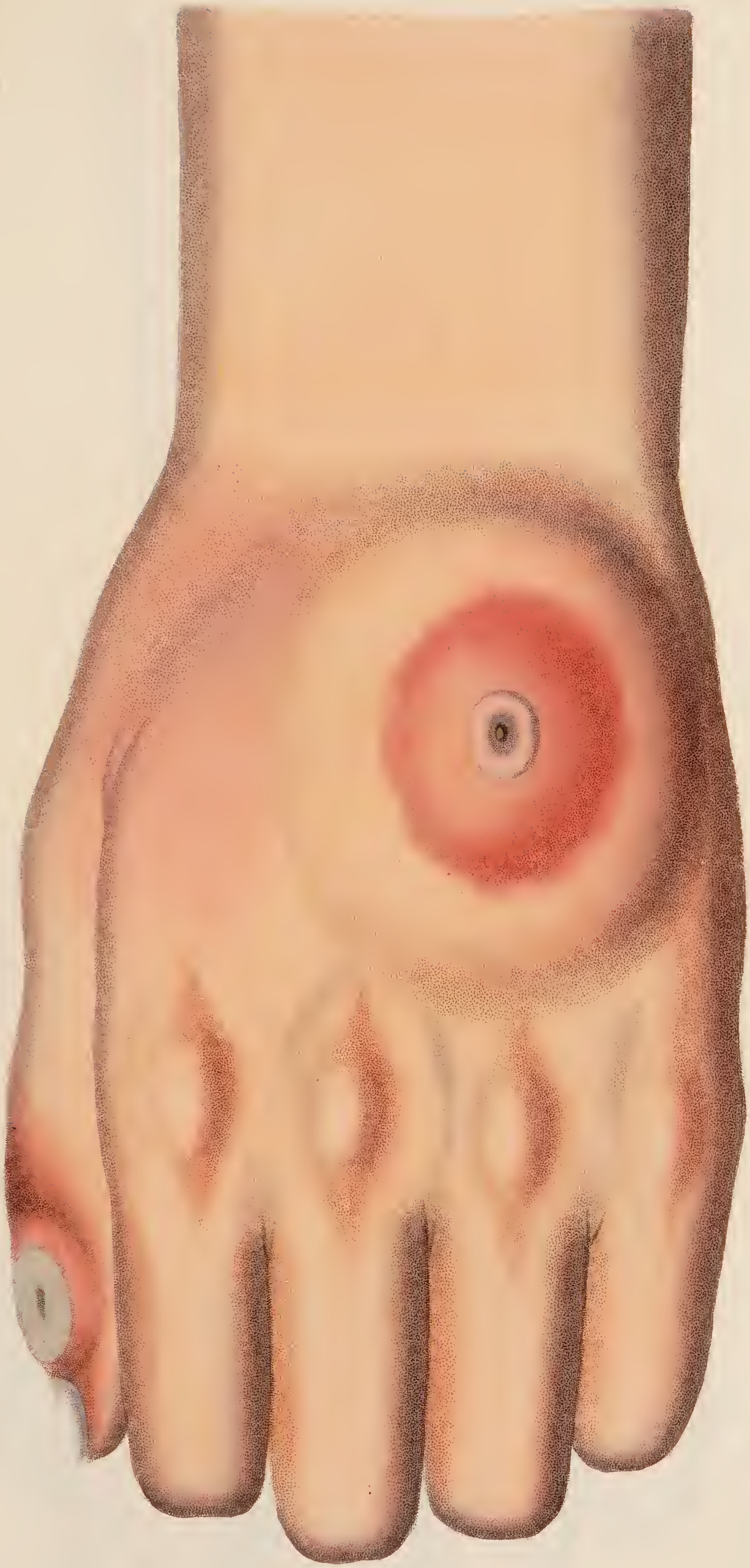

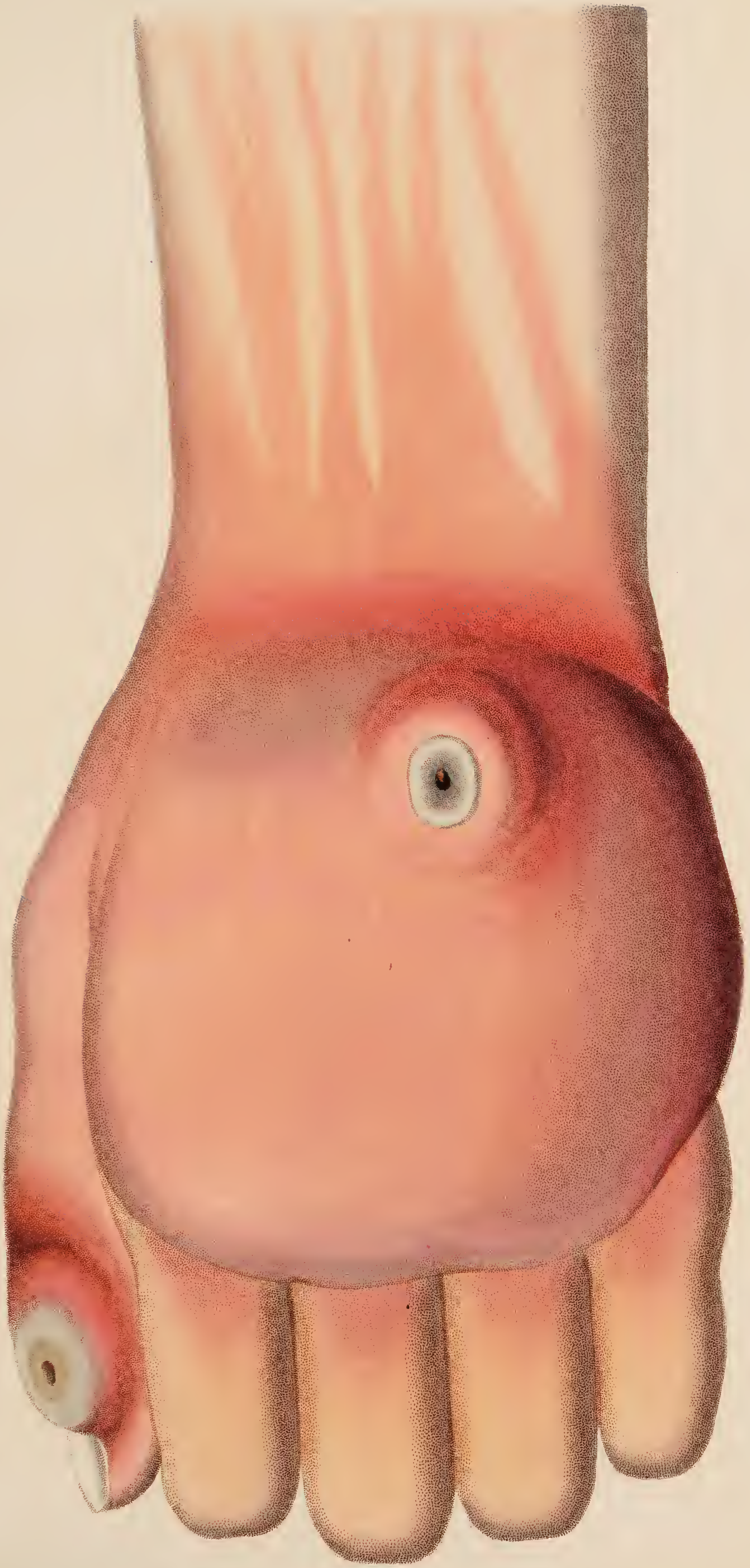

PLATE

Fig. 3.

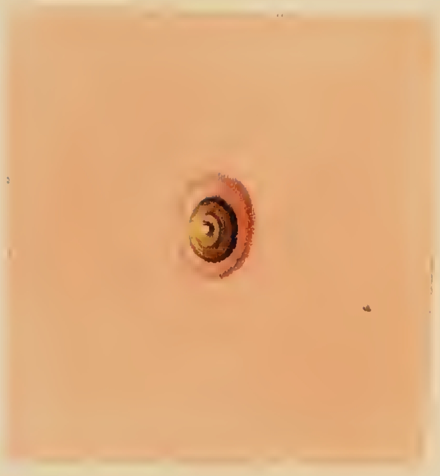

Fig. 2.

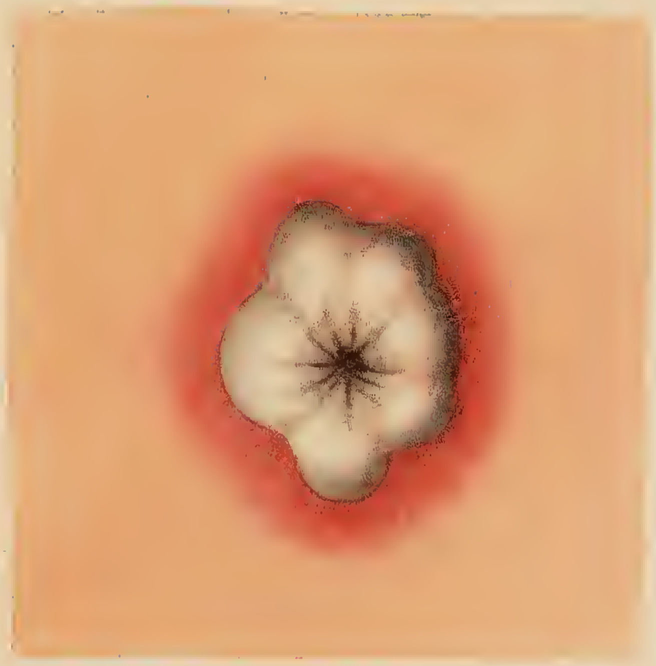

Fig. 1.

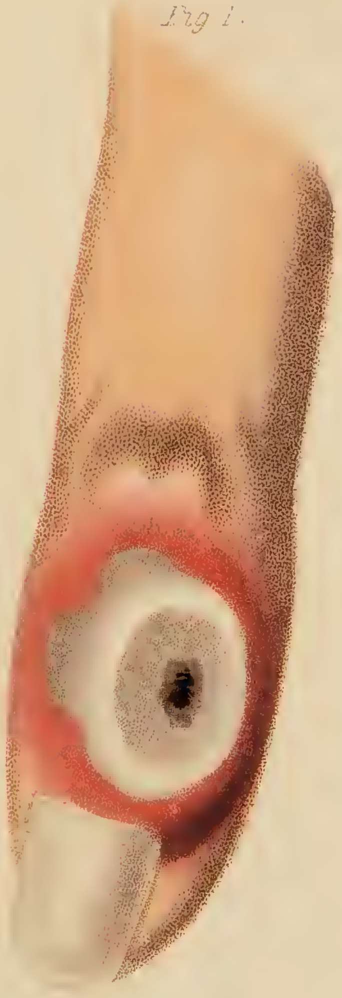

Fig. 2